

# Construals of Preillness Relationship Quality Predict Cardiovascular Response in Family Caregivers of Alzheimer's Disease Victims

Bert N. Uchino, Janice K. Kiecolt-Glaser, and John T. Cacioppo

The authors examined the relationships between family caregivers' construal of their preillness affection for and cohesiveness with an Alzheimer's disease (AD) patient and subsequent cardiovascular functioning. Scale validation demonstrated the psychometric properties. In a study conducted 2 years later, 31 family caregivers of AD victims performed stress-inducing tasks while cardiovascular activity was monitored. Path analyses revealed that caregivers relatively high in preillness affection for the AD patient were characterized by lower heart rate reactivity and resting diastolic blood pressure. In contrast, caregivers relatively high in preillness cohesion were characterized by higher resting systolic and diastolic blood pressure. These results suggest that caregivers' social relationships may play an important, although not always beneficial, role in cardiovascular regulation and health.

The chronic stress of caregiving for a family member with Alzheimer's disease (AD) has been associated with negative changes in psychological (Schulz & Williamson, 1991) and immunological function (Kiecolt-Glaser, Dura, Speicher, Trask, & Glaser, 1991). Not all caregivers are equally affected, however. We have previously found that caregivers' perceptions of social support moderate the negative impact of caregiving, as indexed by immune function (Kiecolt-Glaser et al., 1991) and cardiovascular reactivity (Uchino, Kiecolt-Glaser, & Cacioppo, 1992). The present research focused on the prediction of cardiovascular functioning by the caregiver's construals of the nature of the caregiver-patient relationship before the onset of AD.

## Social Factors and Cardiovascular Functioning

Dietary (e.g., salt intake) and lifestyle factors (e.g., exercise) have strong influences on cardiovascular functioning. Recent

research has also indicated that social factors may moderate cardiovascular reactivity in response to acute psychological stressors (Fleming, Baum, Davidson, Rectanus, & McArdle, 1987; Gerin, Pieper, Levy, & Pickering, 1992; Kamarck, 1992; Kamarck, Manuck, & Jennings, 1990; Uchino et al., 1992). For instance, Fleming et al. (1987) examined the impact of crowding stress on cardiovascular reactivity. Subjects from relatively crowded areas (i.e., within two blocks of a store or commercial complex) performed a laboratory stressor while measures of cardiovascular reactivity were assessed. Results revealed that crowded residents evidenced greater increases in heart rate and systolic blood pressure to the acute psychological stressor compared with demographically similar control subjects. The authors suggested that the chronic stress of crowding may increase sympathetic tone and thus lead to potentiated physiological responses.

Recently, Uchino et al. (1992) reported evidence that the overall level of social support may impact on age-related changes in cardiovascular functioning. Uchino et al. examined the effects of a chronic social stressor (i.e., caregiving responsibilities for a family member with AD) and social support on age-related changes in cardiovascular reactivity to acute psychological stressors. Results revealed that caregivers high in social support evidenced typical age-related decreases in heart rate reactivity, whereas caregivers low in social support showed age-related increases in heart rate reactivity. Additionally, only subjects low in social support evidenced age-related increases in systolic blood pressure. These results remained significant after controlling for depression and relevant health-related behaviors (e.g., exercise and alcohol consumption).

Despite the growing literature on social relationships and physiological functioning, the components of social relationships that predict or influence physiological functioning need examination. For example, social support has been recognized as a multidimensional construct containing emotional and tangible components (Wills, 1985). Moreover, subjects' perceptions of social relationships appear to be especially important in predicting AD caregivers' cardiovascular responses to stress (Uchino et al., 1992).

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There are conflicting reasons to expect a caregiver's memory and construal of his or her preillness affection for the AD patient to be related to cardiovascular reactivity. On the one hand, the daily burden of caregiving may be heightened by bereavement over the deterioration of a loved one. Consistent with this reasoning, Cantor (1983) found that closer caregiver-patient familial bonds were associated with greater caregiver strain. Therefore, caregivers who remember their relationship with a family member before the onset of AD as characterized by relatively strong affection may be particularly stressed by the functional loss of this loved one and consequently may develop heightened cardiovascular reactivity. On the other hand, caregivers who remember this preillness relationship as being particularly affectionate may draw some sustenance while caregiving from the perception that they are helping a loved one in need. Consistent with this reasoning, a close caregiver-patient relationship has been associated with less perceived burden (Williamson & Schulz, 1990), less perceived stress (Horowitz & Shindelman, 1983), and lower levels of depression (Schulz & Williamson, 1991; but see Gilhooly, 1984). Therefore, construals of relatively strong affection for the family member before the onset of AD may lighten the burden of caregiving and lessen to some extent the caregiver's subsequent cardiovascular reactivity.

We investigated these competing hypotheses as part of a longitudinal study of the psychological and physiological effects of the chronic stress of caregiving for a family member with AD. In the second year of the caregiver's participation in the protocol, they were asked to rate their affection for and the time spent together (i.e., cohesiveness) with the patient before the onset of AD. These questions were thought to tap the emotional quality and the cohesiveness of the prior relationship between the caregiver and patient. We began, however, by examining the factor structure and psychometric properties of this prior relationship quality assessment. Cardiovascular reactivity to acute psychological stressors was determined during the fourth year of the protocol. Because of the longitudinal nature of the study, we used two path analytic models to examine the possibility that the caregivers' construal of the quality of the preillness relationship between herself or himself and the AD patient may influence subsequent cardiovascular functioning.

In the first path model, we examined the relationship between a caregiver's retrospective report of the nature of the preillness relationship with the AD patient and the caregiver's resting level of cardiovascular activity. Basal levels of cardiovascular activity, which provide information on the tonic physiologic state of an individual, are conceptually and, through the use of residualized change scores, statistically distinct from reactivity measures. In the second path model, we investigated the relationship between prior relationship quality and cardiovascular reactivity to acute psychological stressors using residualized change scores (see Cohen & Cohen, 1983). Cardiovascular reactivity to acute psychological stressors is thought to provide information on an individual's reactivity to daily hassles and stressors (Matthews, Owens, Allen, & Stoney, 1992; Pollak, 1991). We investigated both tonic and phasic components of cardiovascular activity because both have been shown to be reliable and sensitive to the influence of chronic stress (Davidson & Baum, 1986; Fleming et al., 1987; Uchino et al., 1992).

## Method

### Subjects

Thirty-one current family caregivers of AD victims participated in the study. Family caregivers were recruited through local dementia evaluation centers, neurologists' referrals, Alzheimer's Disease and Related Disorders Association support groups and its monthly newsletter, respite care programs, and governmental caregiver support groups. To be admitted to the study, caregivers had to be providing at least 5 hr of care per week. Participants were screened such that no subject was taking cardiovascular altering medication (e.g., beta blockers or diuretics).

There were 13 men and 18 women in the sample of 31 caregivers ( $M$  age = 61.87 years). Caregivers had an average family income between \$20,000 and \$29,000 and had completed an average of several years of college. Twenty caregivers were spouses of the AD victim, 10 caregivers were offsprings of the AD victim, and 1 caregiver was an in-law. Many of our participants (19) were caring for institutionalized patients, whereas the remaining participants (12) were at-home caregivers (1 participant cared for a patient living at another family member's household). Subjects had been providing care for an average of 7.35 years and had previously shown evidence of down-regulated immune function and psychological distress as a result of the chronic demands of caregiving (Kiecolt-Glaser et al., 1987; Kiecolt-Glaser et al., 1991).

### Procedure

Participants in the Ohio State University Caregiver Research Project underwent an annual 3-hr psychological and immunological assessment. As part of the psychological assessment, participants filled out the prior relationship quality measure during Year 2 of the project. Two questions measured the caregivers' construal of the affective quality of the caregiver-patient relationship before illness onset. The two questions were (a) how well did you get along with the person for whom you are caring before she or he became ill? (1 = *not at all*, 5 = *extremely well*) and (b) how much did you like the person for whom you are caring before she or he became ill? (1 = *disliked them very much*, 5 = *liked them very much*).

In addition, five questions administered during Year 2 were adapted from the dyadic adjustment scale to measure cohesiveness (Spanier, 1976). The first question asked subjects, how much did you and the person for whom you are caring engage in outside interests together before she or he became ill? (1 = *none of them*, 5 = *all of them*). Finally, caregivers were asked to indicate how often the following events occurred before the relative became ill (1 = *never*, 6 = *more often*) and included the following: (a) have a stimulating exchange of ideas, (b) laugh together, (c) calmly discuss something, and (d) work together on something.

During Year 4 of the program project, cardiovascular reactivity to acute psychological stressors was assessed. Subjects were allowed to adapt to the testing room for approximately 5 min before participation in the cardiovascular reactivity protocol. The cardiovascular reactivity protocol consisted of a mental arithmetic and a structured interview task. The order of the tasks was counterbalanced, and each task was preceded by a 4-min resting baseline. For the mental arithmetic task, subjects performed serial subtractions by sevens from three different three-digit numbers for a total of 3 min. The structured interview lasted 2 min during which time caregivers were instructed to talk about an event or events that had been especially frustrating or difficult for them while caregiving.<sup>1</sup> Following each task, subjects rated how much mental

<sup>1</sup> To control for the influence of speech per se on cardiovascular activity (e.g., Brown, Szabo, & Seraganian, 1988), all subjects were instructed to continue speaking throughout the structured interview task. Such a constraint was not possible for the mental arithmetic task be-

effort was involved in the task (1 = *mentally easy*, 9 = *mentally effortful*) and how unpleasant (1 = *extremely pleasant*, 9 = *extremely unpleasant*) and aroused (1 = *completely aroused*, 9 = *completely relaxed*) he or she felt. Because of the task ratings, the beginning of the second-task baseline was separated from the first task by approximately 3–5 min.

A Cortronic Model 7000 was used to obtain a five beat running average on heart rate and blood pressure. Kamarck et al. (1992) have demonstrated that aggregation across repeated measures within measurement periods and across multiple stressors can considerably increase the measurement reliability of cardiovascular measures. Therefore, this approach was adopted in the current research. The five beat running assessments were averaged within each of the two resting baselines and within each of the two task periods. For purposes of further aggregation, the psychological stressors in our study were developed in pilot testing to be comparable in their cardiovascular activating effects.

## Results

### *Construals of Preillness Relationship Quality Scale Development*

For purposes of scale development, we analyzed the preillness relationship quality assessments available from 88 family caregivers who did not participate or were ineligible for participation in the cardiovascular reactivity protocol.<sup>2</sup> Descriptive statistics for each item are presented in Table 1 and underscore the comparability of both samples.

*Factor structure.* The seven scale items were subjected to a principal factors analysis with oblique rotation. Two factors were retained. The first factor contained the five items previously defined as cohesiveness, whereas the second factor contained the two items previously defined as affective quality. The items and factor loadings are presented in Table 2.

*Interitem correlations.* Table 3 displays the interitem correlations for the sample of 88 (top diagonal) and 31 (bottom diagonal) family caregivers. The interitem correlations are consistent with the results of the factor analysis and are similar for both samples. The box in the upper left corner (bottom diagonal) depicts the correlation between the two affective quality measures ( $r = .68$ ) for the sample of 31 caregivers. The lower right triangular box contains the intercorrelations among the cohesiveness items. The median correlation for the cohesiveness items is .65, which is equivalent to the correlation between the affection items and is greater than the median correlation between the affection and cohesiveness items ( $r = .39$ , see lower left box). The pattern of results is identical for the sample of 88 family caregivers and further highlights the comparability of the two samples.

*Internal consistency.* We next examined the internal consistency of the relationship quality measure by calculating Cronbach's alphas for each factor subscale. The internal consistency of the cohesiveness subscale was .94, and the internal consistency of the affective quality subscale was .71.

cause of differences in existing mathematical ability. Performance data for the mental arithmetic task were calculated, however, and analyses revealed no significant association between preillness relationship quality and the total number of problems attempted or the percentage correct. Thus, it is unlikely that preillness relationship quality is confounded with speech per se.

Table 1  
*Means and Standard Deviations for Preillness Relationship Quality Items for Both Samples of Caregivers*

Item (before illness onset)	$n = 88^a$		$n = 31^b$	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Engage in outside interests	3.34	1.11	3.45	0.96
Stimulating exchange of ideas	3.65	1.36	3.71	1.51
Laugh together	4.35	1.33	4.74	1.34
Calmly discuss something	3.90	1.31	4.06	1.29
Work together on something	3.50	1.67	3.84	1.53
Get along with person	4.14	0.76	4.22	0.76
Like person	4.72	0.57	4.77	0.42

<sup>a</sup> Participants in the scale development study. <sup>b</sup> Participants in the cardiovascular reactivity protocol.

In summary, our analyses of the caregiver–patient past relationship quality assessment could be characterized by two factors: cohesiveness and affective quality. Moreover, interitem correlations for the sample of 31 mirrored the results of the factor analysis for the sample of 88 subjects. The internal consistency of each subscale was also high. We next standardized the item scores and averaged within each factor to examine whether construals of preillness relationship quality predicted cardiovascular response in family caregivers of AD patients.

### *Preliminary Analyses*

Analyses were performed pooling across the two psychological stressors and Gender because analyses indicated no significant main effects or interactions on cardiovascular activity. In addition, results indicated that the pooled psychological stressors were successful in elevating heart rate,  $F(1, 29) = 35.10$ ,  $p < .001$ , systolic blood pressure,  $F(1, 29) = 15.16$ ,  $p < .001$ , and diastolic blood pressure,  $F(1, 29) = 34.38$ ,  $p < .001$ .<sup>3</sup> Descriptive statistics are provided in Table 4 separately for men and women. Additional one-way analyses of variance (Gender: male vs. female) on the affective and cohesiveness ratings revealed no significant Gender effects ( $F_s < 1$ ).

<sup>2</sup> Complete data were not available for all subjects for several reasons. Thirty-eight subjects were excluded because they were currently taking medication for cardiovascular problems. In addition, 18 caregivers were excluded because their caregiving status had changed during the 2-year period (e.g., bereaved). Finally, 32 subjects could not be scheduled for the cardiovascular reactivity protocol. The demographic characteristics of these subjects, however, were similar to that of the sample of 31 caregivers. For instance, the larger sample ( $M$  age = 57.8 years) reported an average income between \$20,000 and \$29,000 and had completed an average of several years of college. In addition, these caregivers had been caregiving an average of 7.0 years before their participation in this study.

<sup>3</sup> Main effects for Gender approached significance for heart rate,  $F(1, 29) = 3.71$ ,  $p < .07$ , systolic blood pressure,  $F(1, 29) = 3.94$ ,  $p < .06$ , and diastolic blood pressure,  $F(1, 29) = 4.12$ ,  $p < .06$ . In these analyses, women tended to have higher overall heart rate and lower overall systolic and diastolic blood pressure. Importantly, no interactions involving Gender approached significance.

**Table 2**  
*Factor Structure of the Past Relationship Quality Measure Using Principal Factors Analysis With Oblique Rotation*

Item (before illness onset)	Factor	
	1	2
Engage in outside interests	<b>.76</b>	.02
Stimulating exchange of ideas	<b>.85</b>	.05
Laugh together	<b>.79</b>	.09
Calmly discuss something	<b>.86</b>	.04
Work together on something	<b>1.00</b>	-.14
Get along with person	.01	<b>.69</b>
Like person	-.03	<b>.72</b>

*Note.* Boldface loadings denote items that comprise the respective factors.

*Construals of Preillness Relationship Quality and Cardiovascular Functioning*

Two separate path analyses were conducted using RAMONA PC (Browne & Mels, 1990). In the analyses, maximum likelihood estimates were used to derive the parameter estimates for each path in the model. The correlations matrix used for the path analyses is depicted in Table 5. The first model examined whether construals of preillness relationship quality predicted basal cardiovascular activity in family caregivers of AD patients (see Figure 1).

As expected, the nondirectional path between affective quality and cohesiveness was significant with a parameter estimate of .53 ( $p < .05$ ). More interestingly, caregivers' construals of the affective quality and cohesiveness of their preillness relationship with the AD patient exhibited direct and distinct effects on resting blood pressure.

Caregivers who reported closer affective bonds evidenced lower resting diastolic blood pressure ( $-.40, p < .05$ ). In contrast, caregivers who reported higher preillness cohesiveness with the patient exhibited higher resting systolic (.56,  $p < .05$ ) and diastolic blood pressure (.50,  $p < .05$ ). Thus, caregivers' perceptions of preillness affection for and preillness cohesion with the AD patient were related differentially to resting blood pressure.

Figure 2 depicts the path analysis between cardiovascular reactivity and the caregivers' construals of their preillness affection for and cohesion with the AD patient. Residualized change scores were used to eliminate any effects of baseline on the cardiovascular reactivity assessments. Again, the nondirectional path between affective quality and cohesiveness was significant with a parameter estimate of .53 ( $p < .05$ ). Importantly, only the caregivers' perceptions of their preillness affection for the AD patient appeared to buffer the impact of the acute psychological stressor on subsequent heart rate reactivity ( $-.72, p < .05$ ). Indeed, memories of cohesiveness between the caregiver and AD patient had, if anything, the opposite effect on heart rate reactivity, a pattern replicating the results for basal diastolic blood pressure summarized in Figure 1. No other parameter estimates were significant.<sup>4</sup>

To summarize, results of the path analyses indicated that caregivers' construals of preillness affection for and preillness cohesion with the AD patient were related differentially to cardiovascular functioning. To examine any potential confoundings, correlations were computed between the two subscales of caregiver-patient relationship quality and (a) self-reported affect and mental effort to the tasks and (b) potentially relevant health-related behaviors (i.e., weight, caffeine consumption over the prior 48 hr, alcohol consumption, smoking habits, and hours of vigorous activity during the past week). Results revealed no significant associations with the affective quality assessment (all  $ps > .24$ ). Thus, the assessment of preillness affection for the AD patient does not appear to be confounded by task affect, task effort, or any health-related behaviors measured in this study. In analyses involving the assessment of cohesiveness, one significant correlation emerged. Caregivers who reported greater preillness cohesiveness drank fewer alcoholic drinks during the past week ( $r = -.41, p < .03$ ). It is unlikely that alcohol consumption was mediating the relationship between caregivers' retrospective reports of preillness cohesion and resting blood pressure, however, because alcohol consumption was not significantly correlated with resting systolic ( $r = -.09$ ) or diastolic ( $r = -.12$ ) blood pressure.

**Table 3**  
*Intercorrelations Between Preillness Affective Quality and Cohesiveness Items for Sample of 88 Caregivers (Top Diagonal) and 31 Caregivers (Bottom Diagonal)*

Item	1	2	3	4	5	6	7
1. Get along with person	—	<b>.57*</b>	.43*	.50*	.46*	.49*	.43*
2. Like person	<b>.68*</b>	—	.39*	.46*	.50*	.45*	.39*
3. Engage in outside interests	.31	.18	—	.72*	.68*	.62*	.71*
4. Stimulating exchange of ideas	.49*	.31	.62*	—	.75*	.81*	.80*
5. Laugh together	.58*	.60*	.43*	.64*	—	.80*	.78*
6. Calmly discuss something	.43*	.27	.43*	.76*	.65*	—	.81*
7. Work together on something	.49*	.35	.57*	.69*	.66*	.68*	—

\* $p < .05$ .

*Are Caregivers' Retrospective Reports of Relationship Quality Influenced by the Functional Status of the AD Patient?*

Caregivers' memories of the affective quality and cohesiveness of their preillness relationship with the AD patient are nec-

<sup>4</sup> We duplicated the second path model using simple change scores (i.e., task minus pretask baselines) on the cardiovascular measures instead of residualized change scores. The use of simple change scores resulted in an identical pattern of results. For example, the parameter estimate for the direct path between preillness affection and heart rate reactivity using simple change scores was  $-.65 (p < .05)$ .

**Table 4**  
*Mean Baseline and Task Reactivity for Heart Rate (HR), Systolic Blood Pressure (SBP), and Diastolic Blood Pressure (DBP) for Men and Women*

Measure	Men				Women			
	Baseline		Reactivity <sup>a</sup>		Baseline		Reactivity <sup>a</sup>	
	M	SD	M	SD	M	SD	M	SD
HR (bpm)	67.30	10.32	5.45	3.96	74.07	9.53	5.48	5.73
SBP (mmHg)	139.48	17.86	1.83	3.57	126.02	14.91	3.07	3.38
DBP (mmHg)	89.47	11.34	1.59	1.48	81.12	12.65	0.91	0.89

<sup>a</sup> Task minus pretask baseline.

essarily retrospective. However, the finding that caregivers' construals of how they felt about the patient before the onset of AD predicted cardiovascular functioning 2 years later is consistent with recent research demonstrating the impact of people's perceptions of social relationships on cardiovascular activity (e.g., Kamarck, 1992; Uchino et al., 1992) and health (House, Landis, & Umberson, 1988). These construals are, of course, subject to memory and motivational biases. An important issue, therefore, is whether our caregivers' ratings were biased by the psychological and behavioral functioning of the patient. For instance, were caregivers who reported greater preillness affection for the AD patient simply caring for healthier patients and thus positively biased in their retrospective ratings? To examine such possibilities, correlations were computed between the affective quality and cohesiveness assessments and the Blessed dementia scale (BDS). The BDS, which assesses changes in the memory, behavior, and personality of the patient (Blessed, Tomlinson, & Roth, 1968), was administered during the same session as the relationship quality measure.

Correlational analyses revealed that there was no significant association between affective quality and the BDS. Thus, patient functioning does not appear to confound the assessment of the affection caregivers reported feeling for the patient before the onset of AD. In contrast, two of the correlations between preillness cohesiveness and the BDS were significant. Caregivers who reported greater cohesiveness with the patient before the onset of AD also interacted with patients who exhibited fewer

negative changes in memory ( $r = -.40, p < .03$ ) and personality ( $r = -.47, p < .01$ ). Additional analyses aimed at examining the implications of these findings revealed only a significant correlation between negative changes in patient memory and resting systolic blood pressure ( $r = -.41, p < .01$ ). However, the association between the cohesiveness assessment and resting systolic blood pressure remained significant when controlling for negative changes in patient memory ( $r = .37, p < .05$ ). Therefore, the association between the caregivers' memories of preillness cohesiveness and resting systolic blood pressure does not appear attributable to the functional status of the patient.

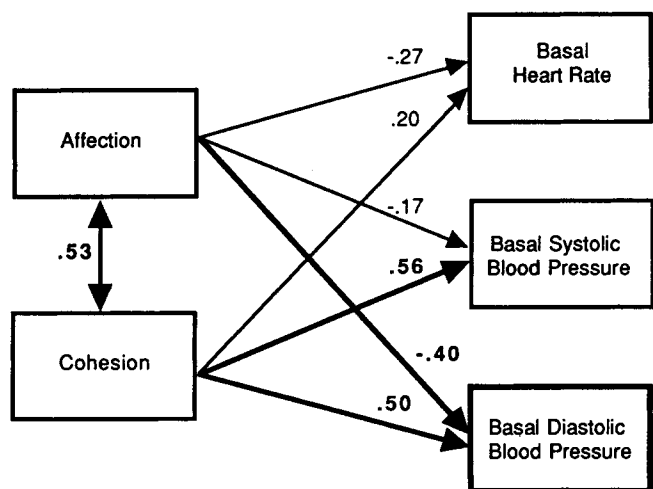
*Are Caregivers' Retrospective Reports of Relationship Quality Influenced by a Negativity Bias?*

The path analyses showed that the caregivers' construals of preillness relationship quality between family caregivers and AD patients predicted and may have contributed to the caregivers' cardiovascular functioning 2 years later. It is conceivable, however, that the retrospective ratings of preillness relationship

**Table 5**  
*Correlations Between Preillness Construals of Relationship Quality and Cardiovascular Functioning*

Cardiovascular measure	Preillness construal	
	Affection	Cohesion
Resting HR	-.16	.06
Resting SBP	.12	.47
Resting DBP	-.14	.28
HR Reactivity	-.58	-.12
SBP Reactivity	-.13	.17
DBP Reactivity	-.01	-.03

Note. HR = heart rate; SBP = systolic blood pressure; DBP = diastolic blood pressure.



**Figure 1.** Path analysis between family caregivers' ratings of preillness affection and cohesiveness for the Alzheimer's disease patient and resting cardiovascular activity. Significant ( $p < .05$ ) path coefficients are depicted in boldface type.

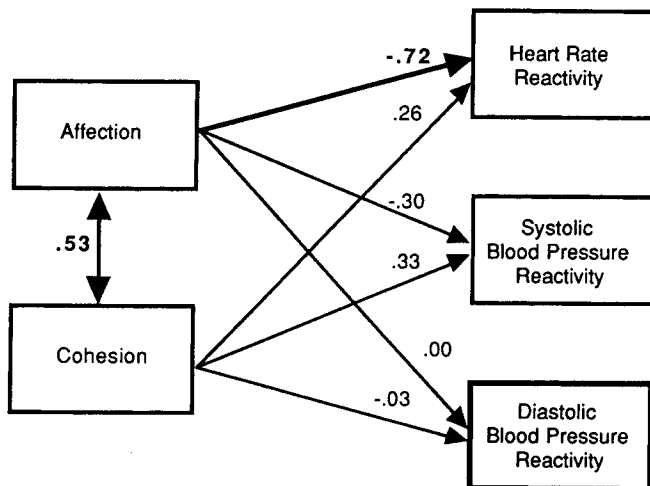


Figure 2. Path analysis between family caregivers' ratings of preillness affection and cohesiveness for the Alzheimer's disease patient and cardiovascular reactivity (i.e., residualized change scores). Significant ( $p < .05$ ) path coefficients are depicted in boldface type.

quality were influenced by a mood-induced negativity bias. For example, Bolger and Eckenrode (1991) have argued that perceptions of personal relationships may be biased by mood-induced negativity. To examine the possible influence of mood-induced biases, we examined the association between the caregivers' ratings of preillness relationship quality and (a) the Hamilton depression rating scale (Hamilton, 1967) and (b) negative affect during the past week from the positive and negative affect schedule (Watson, Clark, & Tellegen, 1988). These surveys were administered during the same session as were the preillness relationship assessments. None of these correlations approached significance (all  $ps > .27$ ). Therefore, it does not appear that the results of the path analyses can be explained in terms of general feelings of depression or negativity.

### Discussion

For most individuals, caregiving for a family member with AD represents a significant and long-term stressor. The results of the present investigation suggest that a caregiver's construal of her or his relationship with the patient before the onset of AD predicts, if not contributes to, subsequent cardiovascular response. Specifically, path analyses indicated that caregivers who reported higher affection for the patient before the onset of AD were characterized by lower resting diastolic blood pressure and lower heart rate reactivity to our experimental psychological stressors than caregivers who reported relatively low preillness affection. In contrast, caregivers who reported relatively high preillness cohesiveness with the AD patient were characterized by higher levels of resting systolic and diastolic blood pressure. Ancillary analyses indicated that the results could not be explained in terms of differences in task performance, task affect, task effort, relevant health-related behaviors, patient status, depression, or negative mood.

The results reported in this study are generally consistent

with past research implicating the importance of affective processes in reducing caregiving stress (Horowitz & Shindelman, 1983; Schulz & Williamson, 1991; Williamson & Schulz, 1990). Williamson and Schulz (1990) found that caregivers who reported a relatively good prior caregiver-patient relationship also experienced less burden and resentment during caregiving compared with caregivers who reported a relatively poor prior caregiver-patient relationship. We extended these results by demonstrating that the more positive the caregiver's construals of their preillness affection for the AD patient, the lower the caregiver's basal diastolic blood pressure and the lower her or his heart rate reactivity to the experimental psychological stressors.<sup>5</sup>

An unexpected finding was that caregivers who reported relatively high levels of preillness cohesiveness with the AD patient also displayed higher levels of basal systolic and diastolic blood pressure when tested 2 years later. At least two possible explanations exist for this effect. First, higher prior cohesiveness may be associated with less physical activity because the patient is less able to engage in activities with the caregiver. Although less physical activity might be expected to contribute to increased blood pressure, contrary to this account, the correlation between past cohesiveness and hours of vigorous activity in the past week was nonsignificant; nor was the caregiver's weight related to the cohesiveness ratings. It is also possible that the loss of cohesiveness in the caregiver-patient relationship is itself a stressor. Given the time demands of caregiving, caregivers may be unable to fill the social void created when the patient developed AD. The ability of environmental stressors to influence long-term changes in blood pressure has been documented in animal models of hypertension (Folkow, Hallback, Lundgren, Sivertsson, & Weiss, 1973; Hallback, 1975; Hallback & Folkow, 1974). Therefore, although virtually ignored in past research, preillness cohesiveness may be an important factor to consider in caregiving stress.

Our primary aim in this study, however, was to examine the impact of emotion-based social processes on physiological functioning. This emphasis is in accord with recent research suggesting that emotional processes play a critical role in physiological regulation and health. Berkman, Leo-Summers, and Horwitz (1992), for instance, reported that higher emotional support, assessed before myocardial infarction, was associated with lower postmyocardial infarction mortality rates. The effects of social factors are not limited to cardiovascular functioning either. In a review of social relationships and health, House et al. (1988) concluded that

<sup>5</sup> Consistent with past research (Cantor, 1983; Horowitz & Shindelman, 1983), most caregivers perceived strong affective bonds with the patient (see Table 1). Despite the consequent restricted range of scores, we nevertheless found strong relationships between preillness construals of affection and cardiovascular functioning. One would usually expect an expansion of the range of scores on this social dimension to strengthen the apparent buffering effects of affection for the recipient of an individual's caregiving. It is conceivable, however, that caregivers who recall disliking (rather than simply liking less) the family member with AD would perform intellectually or emotionally disengaged caregiving and perhaps evidence less a heightening of cardiovascular reactivity over the course of their caregiving.

In none of the prospective studies have controls for biological or health variables been able to explain away the predictive association between social relationships and mortality. Efforts to explain away the association of social relationships and supports with health by controls for personality variables have similarly failed. . . . Social relationships have a predictive, arguably causal, association with health in their own right. (p. 544)

It is our hope that investigation of the social psychological and physiological changes associated with caregiving may help elucidate the pathogenic mechanisms responsible for the long-term health costs and benefits of specific types of social relationships.

There are several limitations of the current study that should be noted. First, although we investigated the relationship between construals of preillness relationship quality and cardiovascular functioning in family caregivers of AD patients, it is uncertain how much these construals changed during the course of caregiving. Longitudinal research in which preillness relationship quality is assessed very early in the course of the disease and repeatedly over the ensuing years of caregiving would therefore be worthwhile. Second, the influence of personality factors per se has not been assessed in the current study. It is possible that personality factors, such as neuroticism, may be associated with both poorer preillness relationships and greater cardiovascular reactivity. Conversely, little research currently exists to support such a link, and the finding that the level of affection and the cohesiveness between caregivers and patients had such different effects on cardiovascular response makes it unlikely that personality factors can provide a simple alternative interpretation.

It is also important to note that the sample size of our study was relatively small. As a result, we were only able to detect large effect sizes (Cohen, 1992). It is possible that preillness construals of affection and cohesiveness have additional effects on cardiovascular functioning, albeit weaker than the significant associations reported in this study. In this regard, it is interesting to note that the nonsignificant paths showed virtually the same pattern: Affection was associated with lower basal cardiovascular functioning and lowered cardiovascular reactivity, whereas cohesion was associated with higher basal cardiovascular functioning and heightened cardiovascular reactivity.

Finally, the results of this study may have important implications for the health of individuals exposed to the chronic stress of caregiving. Increased blood pressure and heart rate reactivity have been implicated as risk factors for cardiovascular disorders (Light, 1981; Light, Dolan, Davis, & Sherwood, 1992; Manuck, Kaplan, & Clarkson, 1983). Moreover, cardiovascular reactivity to acute psychological stress has been found to predict short-term immunological changes (Manuck, Cohen, Rabin, Muldoon, & Bachen, 1991). Knowing the social factors that place caregivers at special risk for developing elevated blood pressure and heart rate reactivity, or sympathetic activation more generally, may suggest interventions to counteract the negative psychophysiological consequences of caregiving. For example, interventions might be aimed at helping familial caregivers resolve past feelings of disaffection and foster the development of realistic but positive emotional relationships with the AD patient (Horowitz & Shindelman, 1983). Caregivers characterized by high preillness cohesiveness may represent a special problem because of the extensive time demands of caregiving. Given re-

cent research showing that social support can buffer the negative physiological changes associated with caregiving stress (Kiecolt-Glaser et al., 1991; Uchino et al., 1992), interventions designed to help these individuals reconstitute their social support network may be beneficial to these caregivers.

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