

Forgiveness and health: The role of attachment

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Abstract

Attachment was examined for its association to forgiveness and health. Young adults were interviewed about a time of conflict with a parent; during rest and interview periods, readings of blood pressure and heart rate were taken. Participants completed surveys of forgiveness, attachment, relationship commitment, parental intrusiveness, and health. Analyses revealed strong associations among forgiveness, attachment, and health. Structural equation modeling indicated a strong, negative direct association between forgiveness and health problems, as well as an indirect association between attachment and health problems through forgiveness. Forgiveness groups differed on heart rate and systolic blood pressure. Psychological tension, created by unforgiveness in a close relationship, may lead to physiological indices of unease, as well as self-reports of physical symptoms, loneliness, and stress.

The association between forgiveness and health appears to be robust (e.g., Harris & Thoresen, 2005; Witvliet & McCullough, 2007; Worthington & Scherer, 2004; Worthington, Witvliet, Lerner, & Scherer, 2005). From large, national probability samples (Toussaint & Cheadle, 2009) to personal interviews, higher levels of state and trait forgiveness have been associated with physiological response levels, physiological reactivity, and self-reported measures of health and illness (e.g., Lawler et al., 2005; Lawler-Row & Piferi, 2006; Toussaint, Williams, Musick, & Everson, 2001; Witvliet, Ludwig, & Vander Laan, 2001). For example, in several studies of interpersonal conflict, such as betrayal within a committed relationship, individuals who describe themselves as more forgiving (trait forgiveness) or who express forgiveness about a particular incident (state forgiveness) have lower blood pressure (Lawler

et al., 2003) and better self-reported health on a variety of negative measures, such as physical symptoms of illness, depression, and stress (Lawler et al., 2005), as well as positive, psychological health (Lawler-Row & Piferi, 2006). Research in this area has shifted from demonstrating the association between forgiveness and health to a study of concepts which could provide a theoretical basis for the relationship.

Initially, the association between forgiveness and health was presumed to rest upon the well-studied correlations between anger and/or hostility and physiological responses, primarily blood pressure and heart rate, related to health (e.g., Barefoot, Dahlstrom, & Williams, 1983; Booth-Kewley & Friedman, 1987; Smith, 1992). Anger and hostility are predictive of heart disease (e.g., Miller, Smith, Turner, Guizarro, & Hallet, 1996; Rosenman et al., 1975) and are thought to operate via greater physiological reactivity to stress, poorer health habits, and reduced social support (e.g., Williams & Williams, 1993; Witvliet, 2001). Furthermore, forgiveness and anger or hostility or aggression are inversely related; therefore, one could logically deduce the expected benefits of

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forgiveness (Carson et al., 2005). However, as Harris and Thoresen (2005) have noted, the correlation between forgiveness and anger does not necessarily mean that the health benefits of forgiveness are uniquely tied to anger reduction. A recent examination of the simultaneous effects of forgiveness and anger on acute physiological responses to stress revealed additive, but independent, effects of both factors on physiological responses and self-reported indices of health (Lawler-Row, Karremans, Scott, Edlis-Matityahou, & Edwards, 2008).

As forgiveness occurs in an interpersonal context, focusing on the role of forgiveness in maintaining meaningful and satisfying relationships may prove to be a more fruitful explanatory concept than anger for understanding the link between forgiveness and health, and one that capitalizes on the positive effect of forgiveness on health. Forgiveness is defined as involving decreases in negative emotions, cognitions, and behaviors, as well as increases in positive feelings and thoughts regarding the offender (McCullough, 2000). As forgiveness is thought to have adaptive value, due to its effects on relationship maintenance (Bono, McCullough, & Root, 2008; McCullough, 2008), its health benefits may result from these effects (Frederickson, 2001). In fact, Karremans, Van Lange, Ouwerkerk, and Kluwer (2003) conducted four studies demonstrating that the psychological benefits from forgiveness are more pronounced in relationships of strong commitment. Similarly, Bono and colleagues (2008) reported intra-personal variations in state forgiveness linked to subjective well-being; this association was mediated by feelings of closeness and commitment.

However, even within committed relationships, individuals differ in their propensity to forgive. Although the parent–adult child relationship is less voluntary than friendship or romantic partnerships, the degree of perceived closeness to parents varies widely among adult children and may play an important role in the effects of forgiveness. Thus, we sought to examine adult attachment style as an explanatory factor that could underlie the association of forgiveness, relationship

quality, and health, within the context of an ongoing relationship. Attachment theory has become a major theoretical perspective in the study of developmental factors that affect relationship quality (Simpson, Rholes, & Phillips, 1996). Derived from the original work of Bowlby (1969), early childhood experiences with primary caregivers set up internal “working models” of self and others that serve as guides to approaching and functioning in subsequent relationships. These working models become increasingly stable across the life span and exert continuing effects on adolescent and adult relationships (Fraley & Shaver, 2000). Building on the work of Hazan and Shaver (1987) that extended attachment theory from parent–child to adult–adult interpersonal relationships, a growing literature has documented the long-term effects of attachment style on an adult’s perceptual, attentional, and cognitive processes that, in turn, direct his or her interpersonal behaviors (Collins & Reed, 1994; Mikulincer & Nachshon, 1991), whether toward parents or to other relationship partners.

Applying this theoretical approach to forgiveness, individuals with secure attachment styles employ more mutual forms of conflict resolution, such as integrative and compromising solutions (Corcoran & Malinckrodt, 2000; Gaines et al., 1997; Shi, 2003). Within the context of interpersonal conflict, securely attached individuals are better able to keep the offender separate from his or her deed, aware that all individuals have complex mixtures of desirable and undesirable traits. Securely attached adults are less likely to idealize their parents or partners and are better able to understand the perspectives of others and to explore possibilities for novel solutions to conflict. In short, they are better able to trust their parents and partners, even when that trust has not been perfectly earned; furthermore, security of attachment promotes both compassionate feelings and altruistic behaviors (Mikulincer & Shaver, 2005). Thus, securely attached individuals show greater organization in the face of interpersonal stress, while also maintaining more cognitively complex views of the offender. This permits them to more fully experience any distress caused

by the betrayal and to take the risk of communicating that distress to the partner, leading to a greater potential of forgiveness (Flanigan, 1992). Therefore, there is a theoretical basis for making the prediction that security of attachment would increase the likelihood of a forgiving response to an interpersonal offense.

In 2000, Feeney reviewed the role of attachment style on health, noting several studies linking security of attachment with lower symptom reporting, health-care utilization, and restriction of normal activities. Even earlier, West, Livesley, Reiffer, and Sheldon (1986) proposed a theoretical model linking attachment with psychiatric symptoms and, therefore, poorer health. Based on this view, insecurity of attachment leads to a nonspecific vulnerability to stress, which influences a person's ability to establish and utilize social support networks and affects an individual's appraisal of stress and subsequent coping strategies. Maunder and Hunter (2001) continued this line of reasoning, proposing three pathways by which insecure attachment could contribute to disease: impaired stress regulation, overuse of external coping methods (e.g., smoking, alcohol, and overeating), and poorer treatment adherence. Consistent with these theoretical views, insecure attachment has been associated with chronic loneliness (Bartholomew & Shaver, 1998), increased stress reactivity in rats (Meaney, 2001), and stress and cardiovascular predictors of poorer health, such as larger physiological responses to perceived stress and impaired rates of recovery (Gallo & Matthews, 2006; Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006; Wearden, Cook, & Vaughan-Jones, 2003), all of which, if chronically repeated, could lead to poorer health outcomes. Furthermore, data from animal models (Meaney, 2001) suggest that nurturant behavior by mothers produces permanent effects on the hypothalamic-pituitary-adrenal cortical responses to stress.

Thus, we propose to examine the role of attachment as an explanatory concept related to forgiveness and health. Although attachment, as measured in adults, is thought to reflect childhood experiences, it can be

evaluated in the context of "people in general," parents or a relationship partner. As college students are in relationships that vary considerably with regard to commitment and duration, we assessed their attachment based on an inventory that tapped current feelings of attachment to parents. The betrayal incident also was related to parents, to better generalize to serious betrayals within ongoing, committed relationships. Therefore, we can assess the role of forgiveness in the context of adult attachment and health. In assessing attachment, we employed an inventory developed by Armsden and Greenberg (1987), which provides a measure, specifically aimed at adolescent working models of parents, that is composed of three subscales: trust, communication, and alienation. The initial psychometric studies documented the association of this measure, in college students, to self-esteem, life satisfaction, and affective states.

In order to test associations among attachment, forgiveness, and health, it is critical that attachment and forgiveness bear a positive association to each other. Lawler-Row, Younger, Piferi, and Jones (2006) reported a positive connection between a categorical measure of attachment (secure vs. insecure) with both state and trait forgiveness, as did Burnette, Taylor, Worthington, and Forsyth (2007). More recently, Burnette, Davis, Green, Worthington, and Bradfield (2009) found that insecurity of attachment was related to both decreased trait forgiveness and increased depression.

Although previous studies have reported associations between cardiovascular responses, self-reported health measures, and forgiveness, no simultaneous assessment of both attachment and forgiveness on physiological responses or other indices of psychological or physical health has been reported. Therefore, this study has three goals: First, we examined the associations between forgiveness, whether assessed as trait or state, and a variety of relationship variables, such as attachment, parental intrusiveness, and commitment to the relationship. We predicted that three dimensions of attachment (trust, communication, and low levels of alienation), as well as lack of intrusiveness and levels of

current commitment, would all be positively related to both state and trait forgiveness.

Second, we predicted that both forgiveness and attachment measures would be related to health. In this study, we employed both self-report and physiological responses to index health. Chronic stress is more generally associated with physiological response levels, whereas acute stress is associated with increased reactivity. Both levels and reactivity have been found to be predictive of subsequent cardiovascular illness and compromised health in general (Cacioppo et al., 1998; Light et al., 1999; Lovallo, 2005; Manuck, 1994).

Finally, given the strength of these relationships as reported in the literature, we expected to find strong associations between both attachment and forgiveness with physiological responses to recalled betrayal (both levels and reactivity), as well as to self-reported health outcomes, such as physical symptoms, loneliness, and stress. Once these associations are documented, then we can examine the role forgiveness plays as a potential mediator within the attachment—health association. Given the role that forgiveness plays in maintaining positive relationships, despite the fact that partners often disappoint or hurt one another, it is predicted that secure attachments achieve at least part of their positive health effects through the medium of forgiveness.

Method

Participants

There were 114 participants, 51 men and 63 women, who received extra credit in their introductory psychology class for volunteering to take part in this study. They were primarily young adults, with a mean age of 20.4 ($SD = 5.2$) years. The majority of participants were Caucasians (83%), with 14 African Americans and 5 “Other.”

Procedure

These data are part of a larger study, with results relating to anger reported in Lawler-Row and colleagues (2008). Students were

tested individually, in a private room. A blood pressure cuff was applied, and practice readings were taken, followed by a 10-min baseline watching a relaxing video. The interview was conducted by one of two individuals and was tape-recorded. The statements “Try to recall a particular time when one (or both) of your parents upset you, made you angry or annoyed, or hurt you. In your own words, please describe the experience in as much detail as you can.” set the stage for the interview. After the initial description, follow-up questions were asked to clarify when the event happened, how the participant responded, and to specify, “what exactly was it about this experience that hurt the most?” After the interview, the participant completed a packet of questionnaires regarding forgiveness, relationship closeness, and the parental intrusion scale. Once these were completed, the interviewer left the room and the individual was asked to relax for a final 5 min. Additional questionnaires were completed in another room, either before or after the interview.

Questionnaires

Forgiveness

State forgiveness was measured with the Acts of Forgiveness scale (Drinnon & Jones, 1999); it contains 45 items, answered on a 5-point Likert scale. The scale has an estimated internal reliability of .96, and test–retest reliability of .90, over 3 months. Sample items are “I am bitter about what happened” and “I rarely think about this event.” Trait forgiveness was measured with the Forgiving Personality Inventory, with 33 items, answered on a 5-point Likert scale (Kamat, Jones, & Row, 2006). It has an estimated internal reliability of .94 and test–retest reliability of .86, over 2 months. Sample items are “Forgiving someone who has wronged you is an invitation for that person to walk all over you” and “I try not to judge others too harshly, no matter what they have done.”

Relationship factors

Attachment was assessed with the Inventory of Parent and Peer Attachment, using only

the parent subscale (Armsden & Greenberg, 1987). This scale contains 28 items and produces three factors: alienation (7 items), trust (10 items), and communication (8 items). In this study, Cronbach's α s for the three scales were .86, .91, and .91. Sample items are "My parents accept me as I am" for trust, "My parent helps me to talk about my difficulties" for communication, and "My parents have their own problems, so I don't bother them with mine" for alienation.

Relationship commitment was derived from a larger measure by Arriaga and Agnew (2001). Six of the 10 items were rephrased to refer to a parent, rather than a relationship partner. Using a 5-point range, from *strongly disagree* to *strongly agree*, participants indicated their agreement with items, such as "I am very close to my parent" and "In all honesty, my friends are more important to me than this relationship," reverse scored. Reliability in this study was .90. Parental intrusion, as a measure of parenting and a divergent measure of connection, was measured from a scale developed by Barber (1996). It contains 8 items, rated on a 3-point scale. Responding that an item was either *not like her/him*, *somewhat like her/him*, or *a lot like her/him*, items included "My parent is a person who is always trying to change how I feel or think about things," and "... brings up past mistakes when s/he criticizes me." This scale has a reported coefficient α of .81; in this study Cronbach's α was .83.

Mental and physical health

Three measures of well-being were included: the UCLA (University of California, Los Angeles) Loneliness Scale, the Perceived Stress Questionnaire, and the Cohen-Hoberman Inventory of Physical Symptoms (CHIPS) scale. Loneliness was measured by a well-validated 20-item scale (Russell, Peplau, & Cutrona, 1980). As forgiveness is proposed to foster satisfying relationships, loneliness would be expected to reflect a relevant psychological outcome. The Perceived Stress Questionnaire (Levenstein et al., 1993) is a measure that reflects psychological well-being more globally and is a measure that is

frequently linked to stress-related health problems. It contains 30 items, answered with a 4-point Likert scale and has an estimated internal reliability of .90 and test-retest reliability of .82, over an interval of 8 days. Physical health was measured with the CHIPS scale (Cohen & Hoberman, 1983), which includes 33 common physical ailments that often bring patients into the health-care system. Respondents rate how frequently various physical symptoms, such as cold or cough, back pain, and sleep problems, have been a part of their life over the past month. The scale has a reported α coefficient of .88.

Finally, physiological measures of health were included. Mean values of systolic and diastolic blood pressure and heart rate were computed for the initial rest period, for three periods of the betrayal interview (minute 1, minute 3, and last minute), and for the final 5-min rest period. For the resting period, means were computed from three blood pressure readings taken at minutes 5, 7, and 9. During the interview, means were taken every 2 min, with most interviews lasting for 5–9 min. During the final recovery period, blood pressure readings were taken at minutes 1 and 3, and averaged. Heart rate means were based on the same minutes, either averaged (for rest and recovery) or as means from minutes 1, 3, and last of the interview.

Statistical design

The first set of statistical tests were employed to address the associations between forgiveness and commitment, attachment, and parental intrusion. After examining whether these variables were affected by participant gender, correlations were computed among the respective measures. Given the number of correlations, α was set at $p < .01$. In addition, regression analyses were computed to determine the relative contributions of attachment, commitment, and intrusiveness to state and trait forgiveness.

Second, we examined the associations between forgiveness and relationship variables and health. After examining whether these variables were affected by gender, correlations were computed to assess their associations

with the self-report health variables. Third, structural equation modeling was employed to determine the model that best represented the association of forgiveness, attachment, and health variables.

Finally, we examined the association of attachment and forgiveness to the physiological outcome measures. We computed multivariate analyses with repeated measures analyses, employing Geisser–Greenhouse corrections for repeated measures.

Results

Means for all the questionnaires are shown in Table 1, separated by gender. Only trait forgiveness differed by gender, with women reporting a higher level of forgiveness ($p < .01$). Thus, any results reported for trait forgiveness include a statistical control for gender.

Relationship factors and forgiveness

Correlational analyses were computed for all relationship factors and forgiveness, as shown in Table 2, rows 1–7. As expected, both trait and state forgiveness were significantly related to all three attachment components of trust, communication, and alienation ($r_s = .32 - .54$, $p_s < .0001$). Furthermore, relationship commitment was highly related to state forgiveness ($r = .65$, $p < .0001$), indicating that forgiveness of a specific event

was positively related to the degree of commitment to that relationship. Commitment was also related to trait forgiveness ($r = .29$, $p < .01$), but more weakly (Hotelling's $t = 4.84$, $p < .001$). The same was true for parental intrusiveness: The association with state forgiveness ($r = -.49$, $p < .0001$) was more robust than that with trait ($r = -.30$, $p < .01$; Hotelling's $t = 2.32$, $p < .01$). In all cases, greater security of attachment was predictive of greater forgiveness.

In order to assess the relative contributions of relationship factors to forgiveness, we computed regression analyses for both state and trait forgiveness. Relationship factors accounted for 23% of the trait forgiveness variance ($r = .479$, $p < .0001$). The beta weights are shown in Table 3, with the alienation component of attachment, or feeling isolated from one's primary caregiver, making the primary contribution to trait forgiveness, as well as commitment. Interestingly, relationship factors accounted for 57% of state forgiveness ($r = .76$, $p < .0001$), with commitment making the largest contribution, followed by the alienation factor and parental intrusiveness. Thus, attachment, particularly the alienation subscale, plays a stronger or more primary role in a general forgiving tendency, while relationship commitment plays a stronger role in forgiving a specific incident.

Relationship factors, forgiveness, and self-reported health

Also shown in Table 2 (rows/columns 8–10) are the correlations of forgiveness, attachment, and relationship factors with stress, loneliness, and physical symptoms. Trait forgiveness was significantly related to stress and loneliness, but not to physical symptoms ($p < .03$). State forgiveness was significantly related to stress, loneliness, and physical symptoms. In both cases, more forgiveness was associated with less stress, less loneliness, and, where significant, fewer physical symptoms.

With regard to relationship factors and health, greater attachment was related to less stress, less loneliness, and fewer physical

Table 1. *M (SD) by gender for questionnaires*

Variable	Males	Females
Trait forgiveness**	118.0 (20.4)	129.1 (17.4)
State forgiveness	177.4 (34.5)	173.8 (31.6)
Trust	32.1 (6.4)	31.4 (7.2)
Communication	27.8 (7.4)	28.9 (7.3)
Alienation	14.2 (4.8)	14.2 (4.7)
Commitment	45.7 (17.0)	46.0 (17.5)
Stress	66.6 (15.8)	68.1 (14.4)
Intrusion	12.6 (3.4)	13.4 (4.4)
Loneliness	35.8 (9.9)	35.0 (10.4)
Physical symptoms	49.7 (15.2)	53.5 (11.7)

** $p < .01$.

Table 2. Correlations among attachment, forgiveness, and health outcomes

	2	3	4	5	6	7	8	9	10
1. Trait forgiveness	.52	.38	.32	-.48	.29**	-.30**	-.41	-.31**	-.21*
2. State forgiveness		.54	.42	-.52	.64	-.49	-.45	-.29**	-.28**
3. Trust			.83	-.71	.46	-.57	-.36	-.40	-.32**
4. Communication				-.65	.38	-.53	-.28**	-.37	-.28**
5. Alienation					-.29**	.48	.51	.49	.38
6. Commitment						-.32**	-.19	-.13	-.13
7. Intrusiveness							.35	.29**	.40
8. Stress								.55	.57
9. Loneliness									.42
10. Symptoms									

Note. All correlations in bold are $p < .0001$.
 * $p < .03$. ** $p < .01$.

Table 3. Regression beta weights for the prediction of forgiveness

Outcome variable: Factors	Trait forgiveness		State forgiveness	
	B	p	β	p
Commitment	.20	.04	.48	.0001
Communication	-.01		-.22	.065
Trust	-.08		.17	
Alienation	-.41	.001	-.295	.002
Intrusion	-.03		-.219	.008

symptoms. In each case, the strongest associations were with the alienation dimension of attachment. Similar findings were obtained for parental intrusiveness, with greater intrusiveness being associated with more stress, loneliness, and physical symptoms. Commitment, on the other hand, although linked to forgiveness and attachment, was not associated with health outcome measures.

As noted earlier, to our knowledge no study has examined forgiveness and attachment simultaneously, as related to physical health or psychological well-being as indexed by stress and loneliness. Structural equation modeling (Amos 17.0) was employed to test the model that attachment has both direct and indirect (through forgiveness) effects on health problems. The model presented in Figure 1 fits the data well, $\chi^2(16, N = 110) = 23.198, p = .11$, comparative fit index (CFI) = .982, root mean square error of approximation (RMSEA) = .064. The path

from alienation to forgiveness was added post hoc, after observing that a model without that path had large residual covariances between alienation and the variables downstream from alienation.

The model indicates that forgiveness has a large, significant, negative, direct effect on health problems, $\beta = -.918, p = .002$. Alienation has a significant, negative direct effect on forgiveness, $\beta = -.569, p < .001$, and a substantial, positive indirect effect on health problems, mediated by forgiveness, with the standardized indirect effect coefficient being .522. The direct effect of attachment on health problems falls short of statistical significance, $\beta = .200, p = .37$. Although the direct effect of attachment on forgiveness falls just short of statistical significance, $\beta = .301, p = .054$, it has a moderate, positive indirect effect on forgiveness (through alienation), the standardized indirect effect coefficient being .425, and a considerable, negative indirect

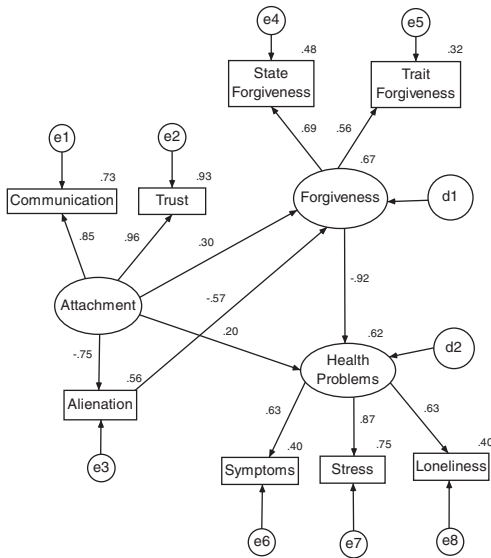


Figure 1. Attachment, forgiveness, and health problems: Structural model with standardized path coefficients.

effect on health problems (through alienation and forgiveness), the standardized coefficient being $-.666$.

Because alienation emerged as a key predictor in this structural model, we also evaluated a model in which the only attachment variable was alienation. This model, presented in Figure 2, fits the data well, $\chi^2(7, N = 110) = 8.562$, $p = .29$, $CFI = .992$, $RMSEA = .045$. As in the first model, health problems are negatively associated with forgiveness, $\beta = -.477$, $p = .029$, and forgiveness is negatively associated with alienation, $\beta = -.701$, $p < .001$. The direct effect of alienation on health problems falls short of statistical significance, $\beta = .285$, $p = .097$, but alienation has a substantial indirect effect on health problems, standardized indirect effect coefficient being $.335$.

Relationship factors, forgiveness, and physiological responses

Correlations were computed for each of the physiological response measures (rest, Interviews 1, 2, and 3, recovery for systolic and diastolic blood pressure and heart rate) with forgiveness and the relationship variables.

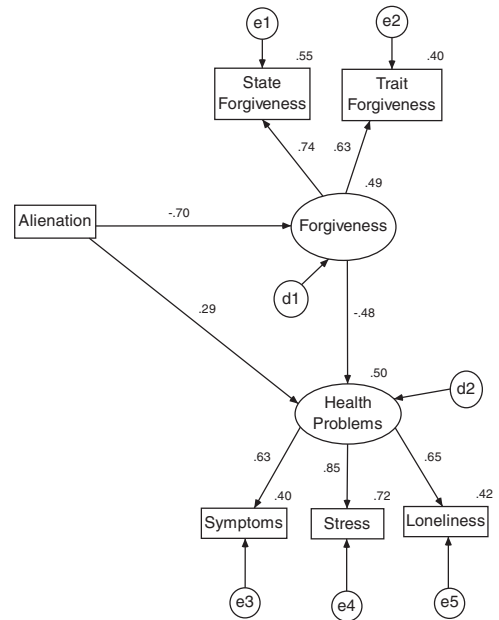


Figure 2. Alienation, forgiveness, and health problems: Structural model with standardized path coefficients.

Only trait forgiveness was significantly related to systolic blood pressure ($r_s = -.29$ to $-.37$, $p_s < .001$ to $.001$). Because none of the relationship variables was significantly related to systolic blood pressure, we could not test for interactive effects. Examining reactivity, with resting systolic blood pressure covaried, there were no repeated measures effects, but an interaction between forgiveness groups and gender, $F(1, 103) = 4.174$, $p < .04$, emerged. For men, the low forgiveness (134.8 mmHg) group systolic blood pressure was not significantly higher than the high (130.9 mmHg), whereas the difference was significant for women (low = 126.8 mmHg, high = 120.1 mmHg). None of the variables was related to diastolic blood pressure.

For heart rate, both state and trait forgiveness, as well as trust, alienation, and intrusion were significantly related to rest, Interviews 2 and 3, and recovery. These are shown in Table 4. To examine the association of attachment and forgiveness across repeated measures, we computed analyses of variance for both trait and state forgiveness groups (high and low, based on median

Table 4. Correlation coefficients between forgiveness, attachment variables, and heart rate

Variable	Heart rate intervals				
	Rest	Interview 1	Interview 2	Interview 3	Recovery
Trait forgiveness	-.24**	-.28**	-.21*	-.21*	-.25**
State forgiveness	-.31***	-.17	-.28**	-.30**	-.25**
Trust	-.40***	-.26**	-.30***	-.34***	-.33**
Alienation	.32***	.21*	.22*	.26**	.32**
Intrusion	.26**	.14	.24**	.26**	.20*

* $p < .05$. ** $p < .01$. *** $p < .001$.

split) with trust and alienation groups. We computed repeated measures analyses for four intervals (Interviews 1, 3, last, and recovery), with rest covaried, to examine reactivity. For either forgiveness group with trust groups, there were no repeated measures effects. For trust and state forgiveness groups, there was a between-subjects interaction, $F(1,79) = 4.107, p < .046$. The lowest heart rate was for the high state forgiveness/high trust group ($M = 73.8$ bpm) and the highest was for low state forgiveness and low trust ($M = 82.7$), with both mixed groups (low forgiveness, high trust and high forgiveness, low trust) in between (77.98, 77.2, respectively).

For state forgiveness and alienation groups, the reactivity analysis yielded interactions of State Forgiveness Groups \times Repeated Measures, $F(3,184) = 3.934, p < .019$, G-G correction, and Alienation Groups \times Repeated Measures, $F(3,184) = 4.241, p < .014$, G-G correction. Examining the state forgiveness groups (Figure 3), the high forgiveness group has lower heart rate at all measurement periods; however, the groups do not differ statistically at Interview 1. Thus, the more forgiving group increases their heart rate more than the less forgiving group as they initially recall and describe the betrayal event. Then, they decrease their heart rate more rapidly, especially from Interview 1 to Interview 2. This is confirmed by a significant quadratic trend ($p < .03$). A similar pattern is seen between the two attachment groups (Figure 4), with all four points showing a difference between high and low alienation groups. Again, the more attached group always has lower heart rate than the high, but

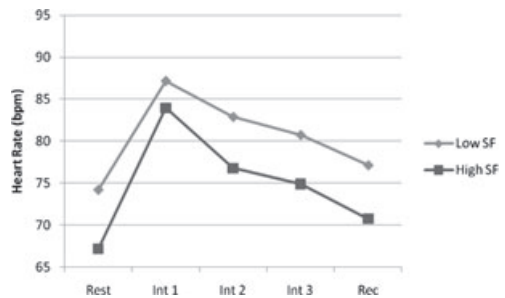


Figure 3. Heart rate means for high and low state forgiveness groups.

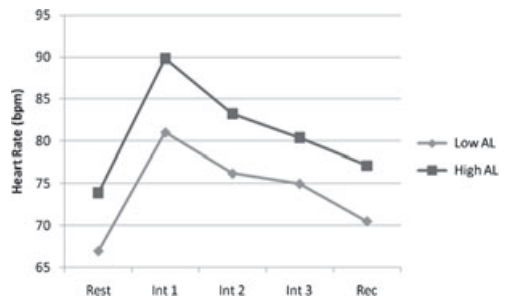


Figure 4. Heart rate means for high and low alienation groups.

the quadratic trend is significant ($p < .01$), with baseline heart rate statistically covaried. Thus, the high alienation group is more reactive than the low. Examining forgiveness and alienation groups, there were no repeated measures effects for trait forgiveness groups.

Discussion

As noted by Worthington, Witvliet, Pietrini, and Miller (2007), “With each successive

review of the literature, the evidence for connections between forgiveness and health mounts" (p. 302). This study is no exception: Measures of both state and trait forgiveness were clearly related to self-reports of stress, loneliness, and physical symptoms of illness, as well as to physiological responses both at rest and during an acute stressor. The challenge now is to determine the theoretical basis of these associations.

This study sought to understand the role of forgiveness in health through the lens of working models of attachment. To the extent that attachment and other relationship factors are associated with forgiveness, those positive associations may be crucial in understanding the link between forgiveness and health. Consistent with attachment theory, we found that both state and trait forgiveness were positively associated with components of attachment (trust and communication) as well as relationship commitment and were negatively associated with measures of alienation and parental intrusion. Specifically, relationship factors accounted for 23% of the variance in trait forgiveness and 57% in state forgiveness. Interestingly, the working model of attachment seems more predictive of the personality measure of forgiveness, while current relationship commitment and intrusiveness were more associated with state forgiveness. This latter effect is consistent with Kluwer and Karremans (2009), who found commitment, a key determinant of state forgiveness.

Of greater focus in this article is the forgiveness—health association and the mechanisms that account for that association. We proposed that three factors associated with relationships, attachment style, perception of intrusion, and commitment, would all facilitate the positive benefits of forgiveness. When examined with correlational analyses, all relationship factors assessed were significantly correlated with forgiveness and all factors, with the exception of commitment, were related to health. Yet, structural equation modeling revealed that forgiveness is a *key* mediator of the association between attachment and health. As shown by the model in Figure 1, the latent variable of attachment, manifested in both

positive (trust, communication) and negative (alienation) affective experiences, has an indirect effect on health problems (coefficient = $-.666$) through forgiveness. Thus, insecurely attached individuals are less forgiving and, therefore, experience more health problems. The alienation scale contributed strongly to the indirect effect of attachment; alienation's indirect effect (through forgiveness) on health problems had a standardized coefficient of $.52$. Furthermore, forgiveness has a direct effect on health problems.

Both Fincham and Beach (2007) and Kluwer and Karremans (2009) question the generality of forgiveness effects estimated from a single, generally serious, recalled betrayal offence. Although the latent variable of forgiveness tested here is related more strongly to state, 32% of the variance in trait forgiveness is explained by its relation to the latent variable. Thus, this model predicting health effects includes contributions by both state and trait forgiveness to the latent variable, acting as a mediator between attachment and health.

Given these models, the results suggest that while forgiveness is operating through some mechanisms (either psychological or physical) to have its effect on health, it is not attachment or relationship working models. Karremans and Van Lange (2008), in their model, suggest that psychological tension mediates the connection between forgiveness and health. That is, when individuals in committed relationships experience unresolved conflict, they experience tension. The physiological responses measured here are consistent with that explanation. Low state forgiveness individuals have slower heart rate recovery after the first interview minute. Furthermore, low trait forgiveness individuals experience higher chronic systolic blood pressure levels. In terms of baseline-adjusted means, less forgiving women had higher systolic blood pressure levels during interview and recovery. Although these physiological responses are acute reactions to a recalled stressor, the expectation is that insecure attachment makes both interpersonal conflict and dysregulated responses to that conflict more likely. Given that such acute responses, repeated

over time, create wear and tear on both the sympathetic–adrenal medullary system and the hypothalamic–pituitary–adrenal cortical system, this heightened reactivity is consistent with subsequent health consequences to both the cardiovascular and immune systems (McEwen & Stellar, 1993; Taylor, Repetti, & Seeman, 1997).

Recent work by Glynn, Christenfeld, and Gerin (2007) found that rumination about prior angering experiences is sufficient to elevate blood pressure above baseline, whether the rumination was immediate (30 min) or delayed (1 week). They interpreted these results as providing a plausible role for angry rumination as a risk factor for cardiovascular disease. Given the critical role that rumination plays in prolonging unforgiveness, this logic supports the predictive validity of forgiveness for improved cardiovascular health.

Flanigan (1992), in her qualitative discussion of forgiveness, notes that it is important to experience the emotions associated with betrayal before forgiveness can genuinely develop. The heart rate means during Interview 1 suggest that more forgiving individuals are actually more reactive from rest to initial recall, but then recover more quickly and fully. This is similar to the pattern described by Dienstbier (1989) as physiological toughness. According to this view, resilience is a function of a satisfactory immediate response to a stressor, followed by rapid adjustment. By this definition, forgiveness may be a means to achieve physiological toughness or resilience in the face of interpersonal stress.

One of the earliest intervention studies with forgiveness was carried out by Al-Mabuk, Enright, and Cardis (1995) with college students who described themselves as deprived of parental love. A 6-day workshop on forgiveness produced significant increases in forgiveness, positive attitudes toward parents, hope, and self-esteem. Although health measures were not included, the present results suggest that such interventions would have a positive impact on health as well. However, the strong association between commitment and state forgiveness raises a caution. As noted by Lamb and Murphy (2002), to provide psychological health benefits, forgiveness

must be consistent with self-respect and autonomy. They emphasize that forgiveness should not be encouraged until individuals have sufficiently worked through the emotional pain of a betrayal.

Recent work by Frederickson (Waugh & Frederickson, 2006) provides an alternative or additional explanation for the health effects of forgiveness. According to the broaden-and-build theory, positive emotions increase the degree of self–other overlap or “oneness,” as well as the complex understanding of another, in that case a roommate. Both these outcomes would increase forgiveness in the face of conflict, thereby reducing psychological tension. A roommate, like a family member, is a relationship not easily altered, at least in the short term. To the extent that forgiveness can be facilitated, either by positive emotions or through increasing attachment security, this study suggests that health benefits would be predicted.

There are limitations to this study. First of all, we have limited the sample to college-age students and the betrayal to one associated with parents. Whether attachment continues to play such an important role in the association of forgiveness and health with older individuals and with betrayals beyond the nuclear family requires further research. In addition, there are other factors which can affect cardiovascular responses and self-reported health, such as body mass index, caffeine and alcohol use, and smoking. Post hoc analysis of demographic data gathered here found that smoking (yes–no) was related to resting heart rate ($r = .31, p < .001$), and the number of alcoholic drinks per week were related to resting systolic blood pressure ($r = .28, p < .003$). However, only 15 of the 114 participants smoked, and 50% of the sample reported no alcoholic drinks per week and 67% reported three or fewer. Thus, while these factors are unlikely to have varied systematically with both attachment and forgiveness in a way to account for the present results, future studies may consider examining such health behaviors more explicitly. As for potential associations with forgiveness and attachment, post hoc analysis found that trait forgiveness was correlated with number of alcoholic drinks

per week ($r = -.34$, $p < .0001$) and with hours worked per week ($r = -.38$, $p < .02$). Trust and communication were also related to hours worked per week ($r_s = -.34$, $p < .03$; $r_s = -.43$, $p < .007$, respectively). As with smoking and drinking, only 41 of the 114 participants worked at all, and of those, 72% worked 20 or fewer hr per week. For alienation, there were correlations with smoking (yes–no) such that more alienated participants were more likely to smoke ($r = -.21$, $p < .03$) and consumed more cups of tea per day ($r = .26$, $p < .009$). Thus, there may be physiological reactivity, health behaviors, and interactive effects which may impact the role that forgiveness and attachment play in health problems.

Future studies should also compare the predictive power of the alienation subscale with more commonly employed measures of avoidance and anxiety as adult attachment measures. There may be something unique about the alienation measure that operates on health through forgiveness. For example, alienation may deactivate the caregiving system (Mikulincer & Shaver, 2005), which would decrease both compassion and altruism, or attachment in general may achieve its health effects through the media of factors that maintain relationships under stress, of which forgiveness would play a significant role. Similarly, longitudinal studies are needed to determine the causal role forgiveness may play in health. Although forgiveness as a person variable cannot be randomly assigned to individuals, longitudinal studies would permit one to determine the predictive power of forgiveness in health. Furthermore, with multiple points of assessment, one could determine whether changes in forgiveness portend subsequent changes in health.

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