Couple and Family Psychology: Research and Practice
2015, Vol. 4, No. 1, 39–48

2160-4096/15/$12.00 http://dx.doi.org/10.1037/cfp0000038

Forgiveness and Cardiovascular Functioning in Married Couples

Frank D. Fincham, Ross W. May, and Marcos A. Sanchez-Gonzalez
Florida State University

Few studies have investigated the physiology underlying forgiveness, and those that have ignore the intimate relationship context. The present study, therefore, examined blood pressure and myocardial oxygen consumption, 2 indices of cardiovascular functioning, in a sample of married couples ($n = 90$) recruited from the community. Both trait forgiveness and forgiveness specific to the spouse (dyadic forgiveness) were examined. The actor-partner interdependence model was used to examine actor (intrapersonal) and partner (interpersonal) effects of trait forgiveness and dyadic forgiveness on cardiovascular functioning. With marital satisfaction controlled, trait forgiveness yielded actor effects for both indices of cardiovascular functioning among husbands but not wives. However, the strength of the associations for trait forgiveness and dyadic forgiveness did not differ significantly between husbands and wives. This research is the first to model physiology through dyadic data analysis. These findings are discussed in terms of sex differences in forgiveness, and suggestions are outlined for future research.

Keywords: forgiveness, marriage, cardiovascular function, blood pressure, actor partner interdependence model

Using a nationally representative data set, Toussaint, Owen, and Cheadle (2012) found that forgiveness predicted mortality, suggesting that failure to forgive may be life threatening. Although this finding is consistent with data showing that forgiveness is associated with cardiac risk in both community and patient populations (Friedberg, Suchday, & Srinivas, 2009; Toussaint & Cheadle, 2009), relatively few studies have investigated the physiology underlying forgiveness (e.g., Crowley, 2014; see Worthington & Sotoohi, 2010 for a review). The need to investigate the role of forgiveness in health outcomes is even more apparent in the growing literature on forgiveness in families (see Fincham, in press). After all, family relationships play an integral role in the psychological and physical health of family members (see Beach & Whisman, 2012; Fincham & Beach, 2010), and forgiveness in such relationships may provide a window for understanding the link between family relationships and health. The present study, therefore, investigates forgiveness and indices of cardiovascular functioning among married couples.

Forgiveness Conceptualized

It is necessary to clearly conceptualize forgiveness because "if the physiological study of forgiveness processes is to progress, researchers must be increasingly precise in defining what they are measuring when they study 'forgiveness'" (Worthington & Sotoohi, 2010, p. 309). Forgiveness has been most frequently characterized in terms of a motivational change in which a cluster of negative characteristics (e.g., resentment, anger, retaliatory impulses, withdrawal) are overcome. Although investigation of this decrease in unforgiveness has paid handsome dividends, it is a logical error to infer the presence of the positive (e.g., health, forgiveness) from the absence of the negative (e.g., illness, unforgiveness). Therefore, it bears noting that fundamental to forgiveness is "an attitude of real goodwill toward the offender as a person" (Holmgren, 1993). Fincham (Fincham, 2000, 2010; Fincham, Beach, & Davila, 2004)

Frank D. Fincham, Ross W. May, and Marcos A. Sanchez-Gonzalez, Family Institute, Florida State University.
This research was supported by a grant from the John Templeton Foundation awarded to Frank D. Fincham.
Correspondence concerning this article should be addressed to Frank D. Fincham, Family Institute, Sandels Building, 120 Convocation Way, Florida State University, Tallahassee, FL 32306. E-mail: ffincham@fsu.edu

has repeatedly argued that this benevolent component of forgiveness is critical in ongoing, intimate relationships because it underlies approach motivation and is therefore fundamental to relationship maintenance following a transgression. Indeed, this component of forgiveness can be empirically distinguished from unforgiveness in intimate relationships (Fincham & Beach, 2002; Paleari, Regalia & Fincham, 2009).

The conceptualization of forgiveness is further complicated by the fact that it can also be viewed at different levels of specificity: as a trait, as a tendency toward a specific relationship partner, and as an offense-specific or episodic response (see McCullough, Hoyt, & Rachal, 2000). Trait forgiveness occurs across relationships, offenses, and situations. Dyadic forgiveness, however, is limited to the tendency to forgive a particular relationship partner across multiple offenses. Finally, offense-specific or episodic forgiveness is defined as a single act of forgiveness for a specific offense within a particular interpersonal context. Associations among these levels of forgiveness are modest at best (e.g., Allemand, Amberg, Zimprich, & Fincham, 2007; Eaton, Ward Struthers, & Santelli, 2006). For example, Allemand et al. (2007) and Rye et al. (2001) found that correlations between trait and episodic forgiveness ranged from .12 to .30.

Physical health is most likely related to stable indices of forgiveness. This is because such indices tend to exert chronic effects on physiological functioning (Fincham, in press), and therefore trait forgiveness and dyadic forgiveness are investigated in the present study. In light of the emphasis given to the positive or benevolent component of forgiveness in intimate relationships, this facet of spousal forgiveness, rather than spousal unforgiveness, is the subject of our investigation.

Is Forgiveness Related to Cardiovascular Functioning?

In the first physiological study of forgiveness, van Oyen Witvliet, Ludwig, and Vander Laan (2001) had student subjects imagine responding to perpetrators of transgressions in unforgiving and forgiving ways. They found that forgiveness imagery impacted cardiovascular functioning by producing lower heart rate (HR) and mean arterial pressure (MAP) responses than grudge-holding imagery. Lawler's research (Lawler et al., 2003; Lawler et al., 2005; Lawler-Row, Karremans, Scott, Edlis-Matityahou, & Edwards, 2008) subsequently linked forgiveness to hemodynamic markers of cardiovascular health, with the most reproducible relationship demonstrated for diastolic blood pressure (DBP), a finding replicated in other forgiveness research (Friedberg, Suchday, & Shelov, 2007; Larsen et al., 2012; Whited, Wheat, & Larkin, 2010).

Only two studies on forgiveness in intimate relationships provide data on hemodynamic markers of cardiovascular health, but in neither study was this association the focus of the investigation. Lawler-Row, Hyatt-Edwards, Wuensch, and Karremans (2011) examined relationships among attachment, forgiveness, and health in parent–child relationships among college students. Premised, in part, on the view that insecure attachment is associated with stress and cardiovascular predictors of poorer health, these authors suggested that, "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" (p. 171). They showed that forgiveness was inversely related to self-reported health problems and that forgiveness mediated the relation between insecure attachment and health. Moreover, state forgiveness and trait forgiveness were related to HR and HR reactivity in response to and recovery from a stressor, a recalled hurt by one or both parents. Finally, forgiveness groups were formed by a median split of the data (which arbitrarily defines "high" vs. "low") and showed that for women, but not men, a higher trait forgiveness group showed lower systolic blood pressure (SBP) than a lower trait forgiveness group.

Hannon, Finkel, Kumashiro, and Rusbult (2012) examined whether conciliatory behavior—viewed as a proxy for forgiveness when displayed by the victim and amends when displayed by the perpetrator—during discussion of an unresolved marital transgression predicted BP 40 min after the discussion. They found that victim, but not perpetrator, conciliatory behavior was inversely related to own and spouse's DBP and SBP. Two important considerations raise questions about these findings. First, the

absence of a baseline measure of blood pressure (BP) is problematic as are the nature of some of the tasks performed in the 40 min after the discussion (e.g., ego-depletion task). Second, did the study measure something different from positive and negative interaction behavior (both types were used to assess conciliatory behavior)? This is important because there is a robust literature showing a link between such interaction behaviors and health outcomes (e.g., Kiecolt-Glaser et al., 2005).

The Present Study

To advance the integration of forgiveness and cardiovascular research in couples, the present study is the first to examine two standard indices of global cardiovascular functioning in a sample of married couples recruited from the community. The first index was MAP, an overall index of BP and hemodynamic functioning. The second index was rate pressure product (RPP), a marker of myocardial oxygen consumption (e.g., cardiac workload) that has been identified as the benchmark for evaluating cardiac treatment rehabilitation success (Gobel, Norstrom, Nelson, Jorgensen, & Wang, 1978).

The study is unique as it focuses specifically on the physiology of forgiveness in marriage and uses dyadic analyses to account for nonindependence in the data (see Figure 1). Because marital satisfaction is related to numerous health indices (Kiecolt-Glaser & Newton, 2001) and to forgiveness (Fincham, Hall, & Beach, 2006), it was controlled in these analyses. In light of the literature reviewed earlier, it was anticipated that both actor (intrapersonal) and partner (interpersonal) effects would emerge. Specifically, failure to forgive is related to later ineffective conflict resolution (Fincham, Beach, & Davila, 2007), and subsequent relationship stress is likely to exact a physiological toll on *both* spouses.

Method

Subjects

Ninety healthy couples married for at least 1 year and between the ages of 20 and 60 years old were recruited from the community (i.e., local libraries, stores, laundromats, churches, etc.). Couples were initially screened to have no history of hypertension or other heart problems. Husbands averaged 39.37 (SD = 10.97), and wives averaged 38.05 (SD = 10.78) years of age, respectively. Couples identified as African American (n = 11), White (n = 77), and as

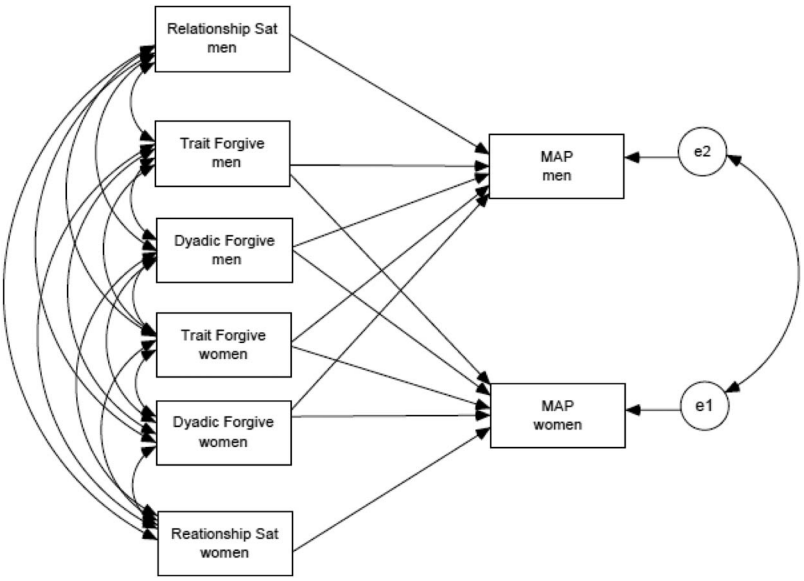

Figure 1. Illustration of model analyzed. Sat = satisfaction; MAP = mean arterial pressure.

more than one race ($n = 2$), and had, on average, been married for 12.26 ($SD = 9.50$) years.

Procedure

Prior to coming into the lab, participants completed an initial 30-min online questionnaire assessing their physical health history as well as relationship information. Couples were then instructed to abstain from caffeine, alcohol, strenuous physical exercise, or any BP-affecting medications for at least 24 hr prior to coming to the lab and to refrain from eating at least 3 hr beforehand. Upon arrival at the lab, participants were first introduced to the study procedures and familiarized with the lab setting. Height, weight, and waist and arm circumference were measured, and participants were then connected to BP monitors.

To assure a controlled setting and to minimize potential diurnal variations in vascular activity, lab sessions were conducted during the same time in the evening between 16:00 and 19:00 in a quiet, dimly lit, temperature-controlled room (73 ± 2 °F). Participants were seated facing opposite walls with their backs to each other and given a 10-min rest period before baseline measurements were taken. Immediately after the rest period, brachial BP readings were used to calibrate beat-by-beat finger BP waveforms in order to obtain hemodynamic variables during a 5-min baseline measurement period.

Measures

Beat-to-beat BP. Beat-to-beat HR, SBP, and DBP was recorded via finger plethysmography (Noninvasive Blood Pressure System-100 Biopac, Goleta, CA). This method has been shown to provide accurate measurement of BP when compared with intra-arterial BP (Imholz et al., 1991). We employed two measures of cardiovascular function. MAP was calculated as a composite value of SBP and DBP, where (1/3)SBP + (2/3)DBP = MAP. RPP was calculated as (SBP × HR)/100 and yields a measure of myocardial oxygen consumption. The clinical and physiological significance of these two cardiovascular parameters is very different. MAP is more related to changes in vascular stiffness and vascular function whereas RPP is a measure more related to the heart, specifically how much oxygen (work performed) the heart is using. Each is analyzed separately because combining these two distinct cardiovascular parameters would complicate the physiological interpretation of these parameters.

Trait forgiveness. Trait forgiveness was measured using the 4-item Tendency to Forgive Scale (TTF: Brown, 2003). Brown and Phillips (2005) demonstrated concurrent validity of the TTF with similar dispositional measures of forgiveness as well as discriminant validity of the TTF with measures of both mental health (depression and life satisfaction) and state forgiveness. The TTF asks participants to report how they usually respond when someone offends them. Sample items include, "I tend to get over it quickly when someone hurts my feelings," and "I have a tendency to harbor grudges," (reverse coded). Responses ranged from 1 (*completely disagree*) to 5 (*completely agree*). Responses were summed into an overall score. Reliability for the sample was $\alpha = .84$ for husbands and .80 for wives.

Dyadic forgiveness. Dyadic forgiveness assessed only forgiveness related to the spouse. Because of its significance for relationships, the benevolent component of forgiveness was assessed. Thus, the three positive or benevolence items from the Relationship Forgiveness Scale ("I am quick to forgive my partner," "I try to live by the motto 'Let bygones be bygones' in my marriage," "When my partner wrongs me, I just accept their humanness, flaws and failures") were used (Fincham & Beach, 2002). Responses were given on a 6-point rating scale with endpoints labeled, "strongly disagree" and "strongly agree," yielding scores ranging from 3 to 18 with higher scores reflecting greater forgiveness ($\alpha = .76$ for wives and .63 for husbands). Fincham and Beach (2002) showed that responses on this subscale were negatively related to own and partner aggression, and directly related to own and partner reported positive communication.

Relationship satisfaction. Following Fincham and Bradbury (1987), assessment of relationship quality was restricted to subjective evaluations of the relationship as operationalized in the Couple Satisfaction Inventory (Funk & Rogge, 2007). Starting with 180 items previously used to assess relationship satisfaction, Funk and Rogge (2007) conducted an item response theory analysis to develop a 4-item measure of relationship satisfaction with optimized

psychometric properties. Sample items are "How rewarding is your relationship with your partner?" (answered on a 6-point scale ranging from "not at all" to "extremely") and "I have a warm and comfortable relationship with my partner" (answered on a 6-point scale ranging from "not at all true " to "very true"). Higher scores indicated greater relationship quality. This measure correlates .87 with the widely used Dyadic Adjustment Scale and –.79 with the Ineffective Arguing Inventory (Kurdeck, 1994). Coefficient alpha for the sample was α = .93 for husbands and .93 for wives.

Results

Table 1 shows the correlations among the study variables. As expected, it can be seen that the correlation between trait forgiveness and dyadic forgiveness was statistically significant for both wives and husbands but was only moderate in magnitude.

Because responses from husband and wife are not independent, the data were analyzed using the Actor Partner Interdependence Model (APIM; Kenny, Kashy, & Cook, 2006). This model allows the potential impact of forgiveness on own cardiovascular functioning to be estimated (actor effects) as well as the potential impact of each spouse's forgiveness on the partner's cardiovascular functioning (partner effects). Actor effects, to be measured accurately, should be estimated while controlling for partner effects and vice versa. When manifest variables are used, the standardized effects can be interpreted as path coefficients. A power analysis algorithm has not been explicitly designed for the APIM. However, the basis for this technique is regression. Sample size was therefore determined using regression coefficients as the unit of analysis. A sample size of 90 was chosen as it provides ample power (.90) to detect a medium effect size and sufficient power (.8) to detect an effect size between that of a small and medium effect size (G*Power; Faul, Erdfelder, Buchner, & Lang, 2009).

The APIM can be conducted with distinguishable dyads and with indistinguishable dyads. Heterosexual couples are conceptually distinguishable suggesting that the distinguishable version be used. Nonetheless, even theoretically distinguishable dyads may not be empirically distinguishable. Thus the omnibus test of distinguishability (I-SAT) was conducted (Olsen & Kenny, 2006). In this test, equality constraints are imposed on the means, variances, and covariances of the manifest variables for both members of the dyad. If χ^2 is significant when these constraints are imposed, the couples are empirically distinguishable. If the constraints hold (χ^2 is not significant), then the indistinguishable version of the APIM should be used. In the present study, I-SAT tests indicated that use of the APIM with distinguishable dyads was appropriate.

Two APIM analyses were conducted via structural equation modeling (SEM) to predict MAP and RPP, respectively. In each analysis, husband and wife marital satisfaction were included as control variables to ensure that results pertaining to forgiveness did not simply reflect the effects of marital satisfaction. Both trait forgiveness and dyadic forgiveness were used to predict the cardiovascular outcome. For MAP,

Table 1
Correlations Among Variables for Wives (Above Diagonal) and Husbands (Below Diagonal)

	1	2	3	4	5	Mean	*SD*
1. TTF		.34*	−.26+	−.04	−.03	11.24	3.23
2. RFS	.25+		.39*	−.11	−.10	11.53	3.05
3. CSI	.19	.38*		.01	.09	18.95	4.51
4. MAP	−.25+	−.12	.18		.67*	98.38	8.77
5. RPP	−.29+	−.01	.07	.70*		94.07	16.66
Mean	13.63	12.37	19.53	93.70	85.69		
SD	3.35	2.57	4.12	9.68	17.68		

Note. TTF = tendency to forgive; RFS = Relationship Forgiveness Scale; CSI = Couple Satisfaction Inventory; MAP = mean arterial pressure; RPP = rate pressure product.
+ $p < .05$. * $p < .01$.

the only significant effect to emerge was a husband actor effect for trait forgiveness ($\beta = -.26$, $p < .05$) showing that greater trait forgiveness was associated with a lower MAP.[1,2] To examine possible sex differences, the husband and wife actor effects were constrained to be equal. The change in χ^2 can then be examined using the χ^2 distribution to assess whether the constraint results in a significant disimprovement in model fit. In the present case, the difference was not significant, $\chi^2(1) = 2.4$, $p > .10$, and hence husband and wife actor effects did not differ. To examine whether trait forgiveness and dyadic forgiveness husband actor effects differed significantly, they were constrained to be equal. There was not a significant change in model fit, $\chi^2(1) = 0.1$, $p > .10$.

For RPP, a husband actor effect again emerged ($\beta = -.31$, $p < .01$) showing that greater trait forgiveness was associated with lower myocardial oxygen consumption suggesting better myocardial efficiency (lower RPP). However, when the husband and wife actor effects were constrained to be equal, a statistically significant change in model fit was obtained, $\chi^2(1) = 5.9$, $p < .05$, showing that the relation between trait forgiveness and RPP was significantly larger for husbands than for wives. To examine differences in trait forgiveness and dyadic forgiveness, husband actor effects were constrained to be equal. Model fit did not change significantly, $\chi^2(1) = 3.0$, $p < .09$, showing that husband actor effects for trait forgiveness and dyadic forgiveness did not differ.

In sum, we found intrapersonal effects for trait forgiveness for both MAP and RPP in husbands. However, a sex difference between husbands and wives in this effect occurred only for RPP. Finally, when effects for trait forgiveness and dyadic forgiveness were compared they did not differ significantly.

Discussion

There has been considerable progress in documenting an association between forgiveness and health, but potential physiological mechanisms have received relatively little attention. When studies have examined forgiveness and physiological functioning, they have largely ignored relationship contexts. Because intimate relationships are associated with health, this is a particularly serious omission. The present study, therefore, examined the link between forgiveness and two cardiovascular indices, MAP and RPP, in the context of marriage. Specifically, a distinction was drawn between trait forgiveness and forgiveness specific to the spouse (dyadic forgiveness). To deal with the fact that husband and wife do not yield data that are independent, APIM analyses were conducted. The results showed a reliable actor effect for husbands; trait forgiveness predicted lower blood pressure (MAP) and less myocardial oxygen consumption (RPP), an index of cardiac workload. In both cases, higher trait forgiveness was associated with better and more efficient cardiovascular functioning as reflected in these two indices. The use of APIM analyses provides a novel contribution to the integrated field of forgiveness and cardiovascular research. Without such dyadic analyses, it is not possible to determine the differential contribution of intraindividual and interpersonal effects on forgiveness-hemodynamic relationships.

These findings may appear to contradict the need for specific measures of forgiveness in intimate relationships and suggest that conceptualizing forgiveness at the dispositional level is all that matters. However, such a conclusion would not be justified even though the reasoning that underlies it is endemic in the psychological literature. Specifically, when one variable is a significant predictor of an outcome and another is not a significant predictor, it is often incorrectly concluded that the first predictor is more important than the second. This conclusion can, however, only be justified when a direct comparison is made of the strength of the association between each predictor and the outcome. In the present study, such comparisons showed that there was no significant difference in the strength of the association involving trait forgiveness and dyadic forgiveness and cardiovascular outcome (MAP and RPP), even though the trait forgiveness-outcome association was statistically significant and the dyadic forgive-

[1] When SBP and DBP were examined separately, identical results were obtained. That is, the only significant effect to emerge was an actor effect for husbands.

[2] Also separate APIM analyses conducted for trait forgiveness and dyadic forgiveness yielded the same pattern of results in that significant husband effects emerged for trait forgiveness on both cardiovascular measures. No paths were significant when dyadic forgiveness was used.

ness-outcome association was not. Thus, it would be premature to omit dyadic forgiveness from future research.

As regards sex, a similar logic to that outlined above can be applied. That is, the fact that significant relations were found for husbands and not wives, does not establish the existence of a sex difference. However, explicit tests for sex differences showed that one existed for RPP, namely, trait forgiveness was a significantly stronger predictor of own RPP for husbands than for wives. A recent meta-analysis of 70 studies involving 15,731 participants shows a sex difference in forgiveness, with females displaying more forgiving than males (Miller, Worthington, & McDaniel, 2008). There may even be a biological basis for this difference as this analysis includes data showing that activity in several different brain structures varied in males and females when imagining hurtful events and forgiving. Alternatively, this finding may reflect the absence of control for the phase of the menstrual cycle as this is known to influence cardiac activity in premenopausal women (Adkisson et al., 2010). Whatever the case may be, this finding needs to be replicated.

Limitations and Future Directions

Notwithstanding their novelty, the present results need to be viewed in the context of several limitations. First, the data are correlational, and this limits the ability to make strong causal inferences. However, it does seem plausible that forgiveness might influence cardiac outcomes over time, but this needs to be shown empirically. Consequently, future research should include longitudinal designs as causes precede effects. Also critical is the need to manipulate forgiveness and document its effect on cardiovascular functioning.

Second, the effect sizes found in this study appear modest ($r^2 = .063$ and $r^2 = .084$), but it is important to remember that effects sizes for accepted cardiac interventions are even smaller. For example, the use of aspirin to help reduce myocardial infarcts is only ($r^2 = .0004$) while that for antihypertensive medication and reduced risk of coronary heart disease is below $r^2 = .0009$ (Meyer et al., 2001).

Third, even though care was taken to conceptualize forgiveness and take into account different levels of specificity, at the level of operationalization there was an important difference between the two forgiveness measures used. By design, the measure of dyadic forgiveness focused only on the benevolent or positive facet of forgiveness. However, the measure of trait forgiveness used, the Tendency to Forgive Scale, reflects both unforgiveness and the benevolent or positive facet of forgiveness. It is possible that trait forgiveness yielded results because half of the items assess unforgiveness. Because unforgiveness represents a clear cluster of negative cognitions, affects, and behaviors, including hostility and anger, it is this component that appears most relevant for cardiac functioning. As Boleyn-Fitzgerald (2002) observed, forgiveness is "arguably the most important virtue for controlling anger" (p. 483), a variable that has been implicated in cardiovascular functioning. This observation raises the possibility that our measure of forgiveness may simply serve as a proxy index of trait anger. In light of this concern, it is important to note that there is evidence to show that across three studies and multiple physiological measures, trait forgiveness is related to cardiac functioning independently of anger (May, Sanchez-Gonzalez, Hawkins, Batchelor, & Fincham, 2014). Future studies should therefore include assessment of unforgiveness along with benevolence in measuring forgiveness at each level of specificity studied (e.g., trait, dyad, episode).

Finally, in light of the very modest association noted earlier between trait and event specific or episodic forgiveness, it is important to bear in mind that physiological responses to a specific transgression may relate differently to forgiveness of the transgression compared with those documented in the present study where only general tendencies to forgive were studied. In fact, for particularly severe transgressions (e.g., betrayals, infidelity), it is quite likely that forgiveness may account for a higher proportion of variance in physiological functioning. This is because, absent forgiveness, such events can trigger a cluster of strong negative responses (e.g., rumination, anger, anxiety, and depression), many of which are known to be associated with cardiac functioning (e.g., Nemeroff & Goldschmidt-Clermont, 2012). It is, therefore, important to study event-specific forgiveness to obtain a more complete picture of the relationship between forgiveness and cardiovascular functioning.

Conclusion

Because cardiovascular disease (CVD), including hypertension, coronary heart disease, peripheral artery disease, stroke, and heart failure, is the most prevalent cause of death not only in the United States but globally (Miniño, Heron, Murphy, Kochanek, & the Centers for Disease Control and Prevention, 2007), it is important to understand psychological factors that may influence cardiac function. One such factor is trait forgiveness which, in this study, showed larger effect sizes than those that have given rise to widely accepted preventive interventions for cardiac functioning and hypertension, respectively. Such observations provide support for continued research on the role of forgiveness in cardiovascular functioning. They also highlight the need for continued research on forgiveness interventions to improve not only psychological health but also potentially physical health.

References

Adkisson, E. J., Casey, D. P., Beck, D. T., Gurovich, A. N., Martin, J. S., & Braith, R. W. (2010). Central, peripheral and resistance arterial reactivity: Fluctuates during the phases of the menstrual cycle. *Experimental Biology and Medicine, 235*, 111–118. http://dx.doi.org/10.1258/ebm.2009.009186

Allemand, M., Amberg, I., Zimprich, D., & Fincham, F. D. (2007). The role of trait forgiveness and relationship satisfaction in episodic forgiveness. *Journal of Social and Clinical Psychology, 26*, 199–217. http://dx.doi.org/10.1521/jscp.2007.26.2.199

Beach, S. R. H., & Whisman, M. (2012). Relationship distress: Impact on mental illness, physical health, children, and family economics. In H. M. Foran, S. R. H. Beach, A. M. Smith Slep, R. E. Heyman, & M. Z. Wamboldt (Eds.), *Family problems and family violence* (pp. 91–100). New York, NY: Springer.

Boleyn-Fitzgerald, P. (2002). What should "forgiveness" mean? *The Journal of Value Inquiry, 36*, 483–498. http://dx.doi.org/10.1023/A:1021929531830

Brown, R. P. (2003). Measuring individual differences in the tendency to forgive: Construct validity and links with depression. *Personality and Social Psychology Bulletin, 29*, 759–771. http://dx.doi.org/10.1177/0146167203029006008

Brown, R. P., & Phillips, A. (2005). Letting bygones be bygones: Further evidence for the validity of the Tendency to Forgive scale. *Personality and Individual Differences, 38*, 627–638. http://dx.doi.org/10.1016/j.paid.2004.05.017

Crowley, J. P. (2014). Expressive writing to cope with hate speech: Assessing psychobiological stress recovery and forgiveness promotion for lesbian, gay, bisexual, or queer victims of hate speech. *Human Communication Research, 40*, 238–261. http://dx.doi.org/10.1111/hcre.12020

Eaton, J., Ward Struthers, C., & Santelli, A. G. (2006). Dispositional and state forgiveness: The role of self-esteem, need for structure, and narcissism. *Personality and Individual Differences, 41*, 371–380. http://dx.doi.org/10.1016/j.paid.2006.02.005

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149–1160. http://dx.doi.org/10.3758/BRM.41.4.1149

Fincham, F. D. (2000). The kiss of the porcupines: From attributing responsibility to forgiving. *Personal Relationships, 7*, 1–23. http://dx.doi.org/10.1111/j.1475-6811.2000.tb00001.x

Fincham, F. D. (2010). Forgiveness: Integral to a science of close relationships? In M. Mikulincer & P. Shaver (Eds.), *Prosocial motives, emotions, and behavior: The better angels of our nature* (pp. 347–365). Washington, D.C: APA Books.

Fincham, F. D. (in press). Forgiveness, family relationships and health. In L. Toussaint, E. L. Worthington, Jr., & D. Williams (Eds.), *Forgiveness and health: Scientific evidence and theories relating forgiveness to better health*. New York, NY: Springer.

Fincham, F. D., & Beach, S. R. H. (2002). Forgiveness in marriage: Implications for psychological aggression and constructive communication. *Personal Relationships, 9*, 239–251. http://dx.doi.org/10.1111/1475-6811.00016

Fincham, F. D., & Beach, S. R. H. (2010). Marriage in the new millennium: A decade in review. *Journal of Marriage and Family, 72*, 630–649. http://dx.doi.org/10.1111/j.1741-3737.2010.00722.x

Fincham, F. D., Beach, S. R. H., & Davila, J. (2004). Forgiveness and conflict resolution in marriage. *Journal of Family Psychology, 18*, 72–81. http://dx.doi.org/10.1037/0893-3200.18.1.72

Fincham, F. D., Beach, S. R. H., & Davila, J. (2007). Longitudinal relations between forgiveness and conflict resolution in marriage. *Journal of Family Psychology, 21*, 542–545. http://dx.doi.org/10.1037/0893-3200.21.3.542

Fincham, F. D., & Bradbury, T. N. (1987). The assessment of marital quality: A reevaluation. *Journal of Marriage and the Family, 49*, 797–809. http://dx.doi.org/10.2307/351973

Fincham, F. D., Hall, J., & Beach, S. R. H. (2006). Forgiveness in marriage: Current status and future

directions. *Family Relations: An Interdisciplinary Journal of Applied Family Studies, 55,* 415–427. http://dx.doi.org/10.1111/j.1741-3729.2005.callf.x-i1

Friedberg, J. P., Suchday, S., & Shelov, D. V. (2007). The impact of forgiveness on cardiovascular reactivity and recovery. *International Journal of Psychophysiology, 7,* 87–94.

Friedberg, J. P., Suchday, S., & Srinivas, V. S. (2009). Relationship between forgiveness and psychological and physiological indices in cardiac patients. *International Journal of Behavioral Medicine, 16,* 205–211. http://dx.doi.org/10.1007/s12529-008-9016-2

Funk, J. L., & Rogge, R. D. (2007). Testing the ruler with item response theory: Increasing precision of measurement for relationship satisfaction with the Couples Satisfaction Index. *Journal of Family Psychology, 21,* 572–583. http://dx.doi.org/10.1037/0893-3200.21.4.572

Gobel, F. L., Norstrom, L. A., Nelson, R. R., Jorgensen, C. R., & Wang, Y. (1978). The rate-pressure product as an index of myocardial oxygen consumption during exercise in patients with angina pectoris. *Circulation, 57,* 549–556.

Hannon, P. A., Finkel, E. J., Kumashiro, M., & Rusbult, C. E. (2012). The soothing effects of forgiveness on victims' and perpetrators' blood pressure. *Personal Relationships, 19,* 279–289. http://dx.doi.org/10.1111/j.1475-6811.2011.01356.x

Holmgren, M. R. (1993). Forgiveness and the intrinsic value of persons. *American Philosophical Quarterly, 30,* 342–352.

Imholz, B. P. M., Wieling, W., Langewouters, G. J., & van Montfrans, G. A. (1991). Continuous finger arterial pressure: utility in the cardiovascular laboratory. *Clinical Autonomic Research, 1,* 43–53.

Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic data analysis*. New York, NY: Guilford Press.

Kiecolt-Glaser, J. K., Loving, T. J., Stowell, J. R., Malarkey, W. B., Lemeshow, S., Dickinson, S. L., & Glaser, R. (2005). Hostile marital interactions, proinflammatory cytokine production, and wound healing. *Archives of General Psychiatry, 62,* 1377–1384. http://dx.doi.org/10.1001/archpsyc.62.12.1377

Kiecolt-Glaser, J. K., & Newton, T. L. (2001). Marriage and health: His and hers. *Psychological Bulletin, 127,* 472–503. http://dx.doi.org/10.1037/0033-2909.127.4.472

Kurdeck, L. (1994). Conflict resolution styles in gay, lesbian, heterosexual nonparent, and heterosexual parent couples. *Journal of Marriage and the Family, 56,* 705–722. http://dx.doi.org/10.2307/352880

Larsen, B. A., Darby, R. S., Harris, C. R., Nelkin, D. K., Milam, P. E., & Christenfeld, N. J. S. (2012). The immediate and delayed cardiovascular benefits of forgiving. *Psychosomatic Medicine, 74,* 745–750. http://dx.doi.org/10.1097/PSY.0b013e31825fe96c

Lawler, K. A., Younger, J. W., Piferi, R. L., Billington, E., Jobe, R., Edmondson, K., & Jones, W. H. (2003). A change of heart: Cardiovascular correlates of forgiveness in response to interpersonal conflict. *Journal of Behavioral Medicine, 26,* 373–393. http://dx.doi.org/10.1023/A:1025771716686

Lawler, K. A., Younger, J. W., Piferi, R. L., Jobe, R. L., Edmondson, K. A., & Jones, W. H. (2005). The unique effects of forgiveness on health: An exploration of pathways. *Journal of Behavioral Medicine, 28,* 157–167. http://dx.doi.org/10.1007/s10865-005-3665-2

Lawler-Row, K. A., Hyatt-Edwards, L., Wuensch, K. L., & Karremans, J. C. (2011). Forgiveness and health: The role of attachment. *Personal Relationships, 18,* 170–183. http://dx.doi.org/10.1111/j.1475-6811.2010.01327.x

Lawler-Row, K. A., Karremans, J. C., Scott, C., Edlis-Matityahou, M., & Edwards, L. (2008). Forgiveness, physiological reactivity and health: The role of anger. *International Journal of Psychophysiology, 68,* 51–58. http://dx.doi.org/10.1016/j.ijpsycho.2008.01.001

May, R. W., Sanchez-Gonzalez, M. A., Hawkins, K. A., Batchelor, W. B., & Fincham, F. D. (2014). Effect of anger and trait forgiveness on cardiovascular risk in young adult females. *The American Journal of Cardiology, 114,* 47–52. http://dx.doi.org/10.1016/j.amjcard.2014.04.007

McCullough, M. E., Hoyt, W. T., & Rachal, K. C. (2000). What we know (and need to know) about assessing forgiveness constructs. In M. McCullough, K. I. Pargament, & C. E. Thoresen (Eds.), *Forgiveness: Theory, research and practice* (pp. 65–90). New York, NY: Guilford Press.

Meyer, G. J., Finn, S. E., Eyde, L. D., Kay, G. G., Moreland, K. L., Dies, R. R., . . . Reed, G. M. (2001). Psychological testing and psychological assessment. A review of evidence and issues. *American Psychologist, 56,* 128–165. http://dx.doi.org/10.1037/0003-066X.56.2.128

Miller, A. J., Worthington, E. L., Jr., & McDaniel, M. (2008). Forgiveness and gender: A meta- analytic review and research agenda. *Journal of Social and Clinical Psychology, 27,* 843–878. http://dx.doi.org/10.1521/jscp.2008.27.8.843

Miniño, A. M., Heron, M. P., Murphy, S. L., Kochanek, K. D., & the Centers for Disease Control and Prevention National Center for Health Statistics National Vital Statistics System. (2007). Deaths: Final data for 2004. *National Vital Statistics Reports, 55,* 1–119.

Nemeroff, C. B., & Goldschmidt-Clermont, P. J. (2012). Heartache and heartbreak—The link between depression and cardiovascular disease. *Na-*

ture Reviews Cardiology, 9, 526–539. http://dx.doi.org/10.1038/nrcardio.2012.91

Olsen, J. A., & Kenny, D. A. (2006). Structural equation modeling with interchangeable dyads. *Psychological Methods, 11,* 127–141. http://dx.doi.org/10.1037/1082-989X.11.2.127

Paleari, F. G., Regalia, C., & Fincham, F. D. (2009). Measuring offence-specific forgiveness in marriage: The Marital Offence-Specific Forgiveness Scale (MOFS). *Psychological Assessment, 21,* 194–209. http://dx.doi.org/10.1037/a0016068

Rye, M. S., Loiacono, D. M., Folck, C. D., Olszewski, B. T., Heim, T. A., & Madia, B. P. (2001). Evaluation of the psychometric properties of two forgiveness scales. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues, 20,* 260–277. http://dx.doi.org/10.1007/s12144-001-1011-6

Toussaint, L., & Cheadle, A. C. D. (2009). Unforgiveness and the broken heart: Unforgiving tendencies, problems due to unforgiveness, and 12-month prevalence of cardiovascular health conditions. In M. T. Evans & E. D. Walker (Eds.), *Religion and psychology* (pp. 135–170). New York, NY: Nova.

Toussaint, L. L., Owen, A. D., & Cheadle, A. (2012). Forgive to live: Forgiveness, health, and longevity. *Journal of Behavioral Medicine, 35,* 375–386. http://dx.doi.org/10.1007/s10865-011-9362-4

van Oyen Witvliet, C., Ludwig, T. E., & Vander Laan, K. L. (2001). Granting forgiveness or harboring grudges: Implications for emotion, physiology, and health. *Psychological Science, 12,* 117–123. http://dx.doi.org/10.1111/1467-9280.00320

Whited, M. C., Wheat, A. L., & Larkin, K. T. (2010). The influence of forgiveness and apology on cardiovascular reactivity and recovery in response to mental stress. *Journal of Behavioral Medicine, 33,* 293–304. http://dx.doi.org/10.1007/s10865-010-9259-7

Worthington, E. L., Jr., & Sotoohi, G. (2010). Physiological assessment of forgiveness, grudges, and revenge: Theories, research methods, and implications. *International Journal of Psychology Research, 5,* 291–316.

Received July 23, 2014
Revision received December 22, 2014
Accepted December 31, 2014 ■