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# The Immediate and Delayed Cardiovascular Benefits of Forgiving

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**Background:** The putative health benefits of forgiveness may include long-term buffering against cardiovascular reactivity associated with rumination. Although studies show short-term benefits of adopting a forgiving perspective, it is uncertain whether this perspective protects against repeated future rumination on offenses, which may be necessary for long-term health benefits. Also unclear is whether forgiveness offers unique benefits beyond simple distraction. **Methods:** Cardiovascular parameters (systolic blood pressure [SBP], diastolic blood pressure [DBP], and heart rate) were measured while 202 participants thought about a previous offense from an angry or forgiving perspective or were distracted. All participants were then distracted for 5 minutes, after which they freely ruminated on the offense. **Results:** Angry rumination initially yielded the greatest increase in blood pressure from baseline (mean [M] [standard deviation {SD}]: SBP = 9.24 [11.16]; M [SD]: DBP = 4.69 [7.48]) compared with forgiveness (M [SD]: SBP = 3.30 [6.48]; M [SD]: DBP = 1.51 [4.94]) and distraction (M [SD]: SBP = 4.81 [6.28]; M [SD]: DBP = 1.75 [3.80]), which did not differ from each other ( $p > .30$ ). During free rumination, however, those who had previously focused on forgiveness showed less reactivity (M [SD]: SBP = 7.33 [9.61]; M [SD]: DBP = 4.73 [7.33]) than those who had been distracted (M [SD]: SBP = 10.50 [7.77]; M [SD]: DBP = 7.71 [6.83]) and those who previously focused on angry rumination (M [SD]: SBP = 12.04 [11.74]; M [SD]: DBP = 8.64 [12.63]). There were no differences for heart rate. **Conclusions:** Forgiveness seems to lower reactivity both during the initial cognitive process and, more importantly, during mental recreations of an offense soon thereafter, potentially offering sustained protection, whereas effects of distraction appear transient. **Key words:** forgiveness, cardiovascular reactivity, rumination, distraction, cardiovascular disease, emotion.

SBP = systolic blood pressure; DBP = diastolic blood pressure; CVR = cardiovascular reactivity.

## INTRODUCTION

While forgiving has long been considered an important moral virtue, it also seems to be beneficial for physical health (1). Forgiveness has been associated with fewer reported physical symptoms (2), fewer medications taken (3), a stronger immune system (4), and reduced cardiovascular mortality (5). Despite these robust findings, it remains uncertain whether forgiveness is causally associated with these health benefits (6) and, if so, through which mechanisms they are associated.

One possible mechanism connecting forgiveness to long-term health is that forgiveness is associated with less strain on the cardiovascular system. Studies examining trait forgiveness have generally found this to be true. More forgiving people have lower blood pressure at baseline (7) and also show faster cardiovascular recovery after offense (8,7), yielding lower overall blood pressure (2,9). Because these findings are based on trait differences, however, they cannot speak to whether forgiveness actually plays a causal role in these physiological responses (6).

To try to get closer to a possible causal relationship between forgiveness and blood pressure, several studies have examined state forgiveness by comparing physiological responses to forgiven and unforgiven offenses. Lawler et al. (2) interviewed participants about a time of betrayal and assessed both trait forgiveness and the extent to which participants had forgiven the offender for that particular offense (state forgiveness). Those

with higher state forgiveness showed reduced cardiovascular reactivity (CVR) during the interview, suggesting that forgiveness was beneficial. However, state forgiveness in this case was again determined by the participants rather than by random assignment; thus, it remains possible that some factor other than forgiveness was responsible for buffered CVR.

Wityliet and colleagues (10) addressed this issue by conducting a within-individual study. Participants were assigned to imagine a hurtful incident from an angry perspective and then from a forgiving perspective, for alternating 16-second intervals over the course of several minutes. They found that the intervals of angry, unforgiving thoughts were associated with greater CVR than those in which participants adopted a forgiving perspective, suggesting that forgiveness is associated with cardiovascular benefits independent of the characteristics of the forgiver.

Although this finding suggests that forgiveness strains the cardiovascular system less than anger, it does not answer whether forgiveness offers benefits beyond simply not engaging in unforgiveness, a hyperaroused negative state marked by angry rumination on offenses (c.f. Harris and Thoresen (11)). Angry rumination has been associated with greater short-term CVR (12) and greater long-term cardiovascular morbidity and mortality (13,14); thus, anything preventing angry rumination could be health protective. Distraction, for example, has been found to facilitate cardiovascular recovery after stress compared with rumination (12,15). It could be that any alternative to angry rumination is beneficial and that forgiveness would be no better than distraction. To our knowledge, no study has demonstrated that forgiveness has cardiovascular benefits beyond those of simple distraction.

For forgiveness to have meaningful effects on health, it is likely that it must affect longer-term changes in emotions and cognitions associated with an offense. According to the reactivity hypothesis, although isolated episodes of reactivity during a stressor may not lead to disease, continued elevations in blood pressure brought on by recurring rumination can build up over time, straining the cardiovascular system and increasing risk

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of disease (16,13). The benefits of forgiveness may lie in its enduring nature; forgiving may extend protection by changing the way people think about the incident in the future. When examining the possible health benefits of forgiveness, then, it is important to examine physiological reactivity not only during forgiveness or angry rumination interventions but also during future mental recreations of the event. Although previous research has examined the immediate cardiovascular effects of adopting a forgiving perspective, no study has examined whether engaging in forgiving cognitions changes responses to later contemplation of offenses.

The purpose of the current study was to explore the cardiovascular effects of engaging in forgiving or angry cognitions surrounding an offense, examining reactivity both when these cognitions are first initiated and, more critically, during later unrestrained rumination. This study also sought to compare the possible benefits of forgiveness and distraction during these two periods to determine whether forgiveness offers benefits beyond simple distraction.

## METHODS

### Participants

Participants were 202 healthy undergraduates (168 women) recruited during the summer and fall of 2010, ranging in age from 18 to 29 years (mean [standard deviation] = 20.4 [1.6] years). Of the participants, 63% were Asian, 15.5% were non-Hispanic white, 15.5% were Hispanic/Latino, and 6% were classified as "other."<sup>1</sup> Participants received course credit in exchange for participation. The University of California, San Diego institutional review board approved the study, and participants provided written informed consent before participating.

### Measures

Blood pressure and heart rate (HR) were monitored continuously using an Ohmeda Finapres 2300 (TNO Biomedical Instrumentation, Amsterdam, the Netherlands). This takes beat-to-beat measurements using an inflatable cuff placed on the middle finger of the nondominant hand.

Before the baseline, participants filled out a survey assessing a variety of traits associated with forgiveness, such as angry rumination and desire for revenge.<sup>2</sup> Nine of these items comprised a measure of trait forgiveness. Six items were coded positively (e.g., "generally, I forgive those who hurt me," "withholding forgiveness is wrong," and "I generally make peace with the people who hurt me"), and the other three items were reverse coded (e.g., "I usually hold it against people when they hurt me," and "when someone hurts me I feel resentment toward the offender"). All were rated on a Likert scale from 1 (not at all) to 5 (very much so). These items showed good internal validity ( $\alpha = 0.85$ ) and were normally distributed (mean [standard deviation] = 30.73 [6.1], range = 13–45).

### Procedure

After filling out the trait forgiveness survey, participants sat quietly for 5 minutes to obtain baseline readings. Previous studies using a Finapres have found that 5 minutes is sufficient to produce a reliable estimate of resting levels because the Finapres produces readings with each heartbeat (12,17). Next, all participants were asked to think of a time they had been hurt, betrayed, or offended, preferably somewhat recently and involving a friend or acquaintance rather than a stranger. They were told that they should select an incident but not to

think about it in any detail. Participants were randomly assigned to a condition after choosing an incident to ensure that the condition did not influence their choice.

Participants then engaged in a 2-minute directed rumination task, in which they thought about the hurtful incident from one of three assigned perspectives.

### Forgiveness Condition

Participants were instructed to picture themselves forgiving the offender and were offered the following strategies for doing so:

"Spend the next few minutes thinking about this incident, and picture yourself forgiving the person involved. This could mean picturing yourself simply letting go of hurt and anger and moving on, trying to see the incident from their perspective or imagining what outside circumstances could have influenced their actions, trying to see the good in the other person despite what they did to hurt you, and imagining reconciling with them or anything else you may think is important in forgiving. Be sure to keep your mind on the incident and the process of forgiving the person."

### Angry Rumination Condition

Participants were instructed to picture themselves being angry or offended by the incident and were given the following ideas of things to focus on:

"Spend the next few minutes thinking about this incident, and picture yourself being angry and offended. You could focus on several different parts of being angry: think about their disregard for your feelings, why their actions were so wrong or hurtful, and think of the ways you would like to get revenge or things you would have liked to say or do to them in return. Imagine holding onto the resentment and anger you felt when you were first hurt. Be sure to keep your mind on the incident and the hurt and anger it caused."

### Distraction Condition

Participants were told not to think about the incident they had chosen but instead to think about their activities the previous weekend in a nonemotional way. This was designed to include a recall element like the other conditions but without the emotional component:

"Spend the next few minutes thinking of everything you did last weekend. Try to remember it in as much detail as possible, walking yourself through each hour of each day from Friday evening to Sunday night. Do your best to actually picture yourself in each activity, and remember all the people involved. Imagine the actual activities themselves but do not focus on the emotions that may have been involved."

Directed rumination was followed by a 5-minute recovery task during which all participants looked through pictures of famous faces and highlighted the ones they recognized. This was designed to distract participants from further rumination.

All participants, including those in the distraction condition, then engaged in a 2-minute free rumination task. They were instructed to once again think of the hurtful incident they imagined before (or, for those in the distraction condition, to imagine it for the first time) but were told to imagine it any way they wished:

"Think about the incident you recalled earlier. This time, I would like you to think of the incident and exactly what happened. Walk through it like you are going through it again. Focus on how you feel about the person or people involved. (For those in the rumination or forgiveness condition, to be clear, you no longer have to think about it in the way that we assigned to you earlier. That is, think of or picture the incident however you want to—whatever comes naturally to you when you imagine it now). Walk yourself through the incident in your mind describing what happened as though you were describing it to an outside party. Again, it is important that, as you sit thinking about it, you keep your focus on the incident and the emotions it brings up."

Afterward, participants had another 5-minute recovery period during which they filled out a brief survey and manipulation check. In prior studies looking at poststress recovery, 5 minutes has been sufficient to assess the impact of various interventions, such as rumination, distraction, suppression, music, and forgiveness (2,7,12,15,18,19). Participants were then debriefed and excused.

### Manipulation Check

To ensure that those in the rumination and forgiveness conditions had thought about the incident in the intended way, they filled out a final survey

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TABLE 1. Baseline Characteristics of the Forgiveness, Rumination, and Distraction Conditions

	Forgiveness (n = 69)	Rumination (n = 66)	Distraction (n = 67)
Female, %	82.6	83.3	77.6
Trait forgiveness	30.3 (6.1)	30.8 (6.1)	31.1 (6.1)
Cardiovascular measures			
Systolic blood pressure, mm Hg	110.6 (12.72)	107.5 (12.60)	107.6 (12.60)
Diastolic blood pressure, mm Hg	72.6 (11.3)	73.3 (11.3)	72.7 (11.3)
Heart rate, beats per min	78.8 (11.4)	77.0 (11.5)	77.2 (11.5)

Data are presented as mean (standard deviation) unless otherwise indicated. No between-group differences were significant.

indicating the degree to which they engaged in cognitions indicative of angry rumination or forgiveness during the directed rumination period. This included items such as "I focused on the hurt and anger I felt" or "I tried to see the good in the other person." These were entered into two separate scales to capture participants' focus on forgiveness (seven items;  $\alpha = 0.76$ ) and on anger (six items;  $\alpha = 0.75$ ). Participants also indicated how much they thought about things unrelated to the incident, such as social plans or school. All items were rated on Likert scales from 1 (not at all) to 5 (very much). Because the questions centered on how participants thought about the hurtful incident during the directed rumination period, those in the distraction condition, who were instructed to think about something entirely different, were not given the manipulation check because the questions did not apply to them.

### Data Reduction and Analysis

Cardiovascular parameters of interest were systolic blood pressure (SBP) and diastolic blood pressure (DBP). HR was also included. For each measure, the mean at baseline was subtracted from the mean for each period.

## RESULTS

### Manipulation Check

An analysis of variance (ANOVA) confirmed that those in the forgiveness condition focused on forgiving thoughts significantly more than those in the angry rumination condition during directed rumination ( $F(1,132) = 13.25, p < .001$ ). In addition, those in the angry rumination condition focused on angry thoughts significantly more than those in the forgiveness condition ( $F(1,132) = 33.0, p < .001$ ), suggesting that the manipulation was effective. The conditions did not differ in the degree to which participants thought about things unrelated to the incident ( $F(1,133) = 0.54, p = .46$ ).

### Participant Characteristics

Baseline readings for the three conditions are shown in Table 1. There were no differences between conditions in baseline SBP ( $F(2,145) = 0.95, p = .39$ ), baseline DBP ( $F(2,145) = 0.05, p = .95$ ), baseline HR ( $F(2,145) = 0.39, p = .68$ ), trait forgiveness ( $F(2,197) = 0.25, p = .78$ ), or sex makeup ( $\chi^2(N = 202) = 0.85, df = 1, p = .65$ ). Consistent with previous literature (9), women scored higher in trait forgiveness than men ( $F(1,194) = 11.95, p = .001$ ).

### Cardiovascular Reactivity

#### Systolic Blood Pressure

To determine whether SBP changes throughout the study varied by condition, a repeated-measures ANOVA was performed

on change in SBP from baseline during directed rumination, first recovery, free rumination, and second recovery, with condition as the between-individual factor. Data showed a significant interaction of time and condition on SBP ( $F(6,411) = 2.34, p = .031$ ).<sup>3</sup>

As shown in Figure 1, SBP was smallest during the directed rumination period for those in the forgiveness condition, followed by the distraction and then angry rumination conditions. This replicates previous findings showing that, during directed perspective taking, forgiveness is associated with lower blood pressure than anger. During the free rumination period, those in the forgiveness condition again showed the lowest blood pressure, whereas those in the distraction and angry rumination conditions showed larger blood pressure increases. This persisted into the last recovery period.

Follow-up ANOVAs were then performed to test for significant differences at each individual period. This showed a significant effect of condition on SBP during directed rumination ( $F(2,137) = 6.49, p = .002$ ). Planned comparisons between conditions revealed that those in angry rumination had significantly higher SBP than both those in the forgiveness ( $t = 3.47, df = 139, p = .001$ ) and distraction ( $t = 2.58, df = 139, p = .011$ ) conditions, although these two did not differ from each other ( $t = 0.89, df = 139, p = .38$ ).

There was no difference between conditions in the first recovery phase ( $F(2,137) = 0.91, p = .40$ ). This is consistent with findings showing that strong irrelevant distractors can homogenize blood pressure levels across conditions (12).

Condition had a marginal effect on SBP during free rumination ( $F(2,137) = 2.77, p = .066$ ), and planned comparisons showed a significant difference between the angry rumination and forgiveness conditions ( $t = 2.30, df = 139, p = .023$ ). There was also a marginal effect of condition on SBP during the last recovery ( $F(2,137) = 2.50, p = .086$ ), which in this case was driven by a significant difference between the forgiveness and distraction conditions ( $t = 2.15, df = 139, p = .033$ ), with those in the forgiveness condition again showing the lowest reactivity.

To determine the influence of trait forgiveness on SBP, we performed a median split on the trait forgiveness scores to divide participants into high and low forgivers. A repeated-measures ANOVA was performed using trait forgiveness (high or low) as the between-individual variable and change in SBP

<sup>3</sup>We also ran analyses using trait forgiveness as a covariate. Trait forgiveness did not emerge as a significant covariate, and including it did not change our results.

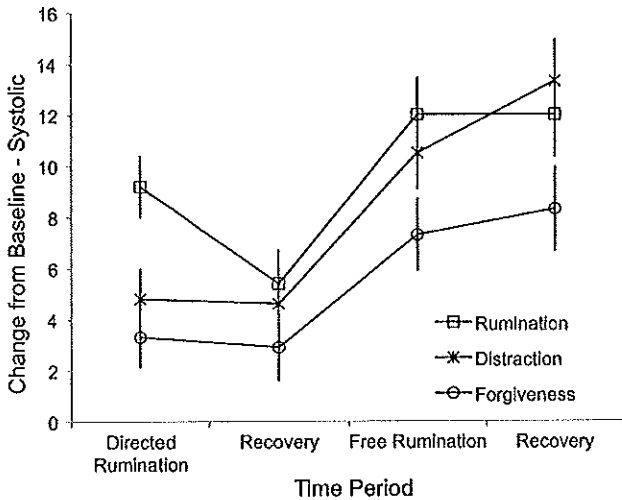


Figure 1. Change in systolic blood pressure from baseline during each period of the study, by condition (error bars represent between-individual standard error).

during the four periods as the within-individual variable. Although those high in trait forgiveness generally had smaller change scores throughout the study, there was no significant difference between high and low forgivers overall ( $F(1,137) = 0.09, p = .77$ ) and no interaction of trait forgiveness and time ( $F(3,411) = 1.1, p = .35$ ).

**Diastolic Blood Pressure**

A repeated-measures ANOVA, like that performed with SBP, was used to determine if DBP changed throughout the study as a function of condition. This again showed a significant interaction of time and condition ( $F(6,411) = 4.37, p < .001$ ).

As Figure 2 shows, the pattern for DBP was similar to that of SBP, particularly for those in the angry rumination and forgiveness conditions. Those in the distraction condition were nearly identical to those in the forgiveness condition during directed rumination and recovery but then rose to the level of those in the angry condition during the free rumination period.

Analysis of DBP during specific periods showed a significant effect of condition during directed rumination ( $F(2,139) = 4.67, p = .011$ ). As with SBP, planned comparisons of conditions showed that DBP was significantly higher in the angry rumination condition than in the forgiveness ( $t = 2.75, df = 141, p = .007$ ) and distraction ( $t = 2.53, df = 141, p = .012$ ) conditions, which did not differ from each other. There was no effect of condition during the first recovery ( $F(2,139) = 0.3, p = .74$ ) or free rumination period ( $F(2,139) = 2.3, p = .10$ ), although the forgiveness condition in this period was marginally lower than the angry condition ( $t = 2.05, df = 141, p = .06$ ). Again, as with SBP, there was an effect of condition on DBP during the last recovery period ( $F(2,139) = 3.11, p = .048$ ). DBP in the forgiveness condition was significantly lower than that in the distraction condition ( $t = 2.36, df = 141, p = .02$ ) and marginally lower than that in the angry rumination condition ( $t = 1.88, df = 141, p = .06$ ).

As with SBP, (trait forgiveness) was not found to influence DBP overall ( $F(1,139) = 0.69, p = .41$ ) and showed no interaction with time across the study ( $F(3,417) = 0.04, p = .99$ ).

**Heart Rate**

The same repeated-measures ANOVA was performed for HR. The analysis showed no interaction of condition and time on HR ( $F(6,420) = 0.98, p = .44$ ). There were also no effects of condition on any of the individual time points (for all,  $p > .2$ ).

**DISCUSSION**

Consistent with previous findings, these data show that imagining a hurtful event in a forgiving way leads to smaller increases in blood pressure than imagining the same event from an angry perspective. Importantly, however, these data also show that engaging in forgiving cognitions can lead to changes that outlast the rumination instructions and that thinking about an upsetting incident from a forgiving perspective can protect against later elevations in blood pressure. When freely thinking about the incident, those who had engaged in forgiving cognitions earlier showed the smallest elevations in blood pressure, although they were given the same instructions at this time as those who had been in the angry rumination condition. These differences persisted into the second recovery period, despite having no instructions to think about the incident at all. This is the first study to show that focusing on forgiveness is protective not only in that moment but can offer recurring protection by changing how individuals respond to subsequent rumination in the near future. Based on theorizing on the reactivity hypothesis (20), it could be this recurring protection that leads to long-term health benefits.

The free rumination period also showed that distraction may not be an entirely effective way to deal with offense. Like those who forgave, those who were distracted initially showed lower blood pressure than those focusing on angry rumination. However, when they were allowed to freely ruminate on

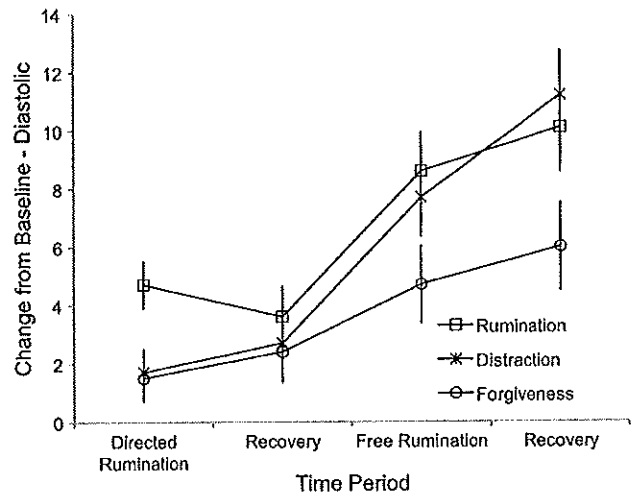


Figure 2. Change in diastolic blood pressure from baseline during each period of the study, by condition (error bars represent between-individual standard error).

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the incident, their blood pressure rose more than did the blood pressure of those in the forgiveness condition and continued to increase into the recovery period. This pattern was especially pronounced in DBP, which showed the distraction and forgiveness conditions to be essentially identical until free rumination, when the blood pressure of those who had been distracted climbed to higher levels. Distraction, then, may be somewhat protective while one engages in it but seems to be ineffective as soon as it ends. The benefits of forgiveness beyond distraction may thus be most pronounced in subsequent mental recreations of the event.

The observed blood pressure pattern suggests that those who simply "let it go" or avoid thinking about an incident may not get all the benefits associated with forgiving. Recent work shows that that compassionate reappraisal is associated with more benefits than emotional suppression while thinking about an incident (21); the current data show that these benefits may extend to subsequent rumination as well. When participants are given time to process the event from a new perspective, even briefly, it seems to alter the way in which they think about the event in the near future. These data suggest that simple cognitive exercises may be enough to initiate this process. The strength of this effect is underscored by the fact that the manipulation lasted only 2 minutes, taking a forgiving perspective was a matter of assignment rather than choice, and participants were specifically told they were not required to take this perspective during free rumination. This demonstrates that the benefits of forgiveness are not restricted to those high in trait forgiveness (7,8) or those who self-report feeling state forgiveness (2) but can extend generally to those assigned to engage in temporary state forgiveness.

There are, of course, various questions not addressed by these data. It is unclear, for example, which forgiving cognitions were most effective. In designing interventions, it would be useful to know which of the suggested strategies is most effective in producing lasting forgiveness. Recent work has explored various strategies of reappraising a hurtful event, such as focusing on compassion for the offender or focusing on the benefits gained through the experience, both of which show unique physiological and emotional benefits compared with angry rumination (22). It remains to be seen, however, which approaches to forgiveness result in greatest long-term health benefits. A mediation analysis of elements of forgiveness and health outcomes showed that reductions in anger did not fully explain health benefits associated with forgiveness (23). Increasing positive emotions and cognitions, then, in addition to reducing anger and hostility, may be necessary to achieving all the benefits of forgiveness. In fact, Worthington and colleagues (24,25) have suggested that replacing negative cognitions with positive ones such as empathy and compassion is the very essence of forgiveness. In this light, it would be useful to study the immediate cardiovascular effects of different forgiveness strategies, including those that simply reduce negative appraisals and those that replace them with positive ones.

In addition, in our study, the "free rumination" period was not entirely unconstrained because participants were still told

to ruminate on the hurtful incident. It is possible that forgiveness would be health promoting not only by reducing the cardiovascular reactions to such thoughts but also by reducing the probability of having such thoughts. Our study, then, might underestimate the benefits. Future research could also explore other effects of forgiveness, such as whether those taking on a forgiving perspective would be less affected by directed negative rumination or less willing to engage in it.

It is unlikely that results during free rumination were due to physiological carryover from earlier rumination because conditions did not differ after the first recovery period and those in the distraction condition showed marked changes from the first rumination period to the second. It is possible, however, that differences in cognitions during free rumination were due to the laboratory environment rather than real cognitive changes. For example, participants in the forgiveness and angry rumination conditions may have felt that they were obligated to continue seeing the incident from the previously designed perspective and that the results reflect a continuation of the earlier directed rumination period. Although this is a concern, participants were explicitly told that they did not have to think about the transgression in the same manner as previously assigned and that they should think about it in whatever way felt most natural. Given these instructions, it seems likely that the effects seen here were due to changes in their mental recreations of the event and not due to direct influence of the earlier manipulation instructions. It is possible, however, that, because participants were in the same context as during the initial rumination period, whatever was "most natural" was simply to think of the incident in the same way they had before. It would be useful for future studies to explore rumination across contexts, particularly outside the laboratory, to determine the strength of the forgiveness intervention.

Another drawback of the current study is that the time limitations of the study period prevented assessment of long-term changes in perspective or CVR. Given the rather short time-frame of our blood pressure monitoring, we cannot assess whether the intervention had any permanent impact, and people may revert after some time to habitual modes of thought. Some work proposing a cycle of rumination and arousal would suggest that changing the arousal associated with thoughts of an event is likely to have ongoing benefits (14,26). Nevertheless, it seems that a clear next step is to investigate forgiveness-associated effects on CVR further into the future to determine how long lasting these effects really are. Such lasting effects may only come after a more thorough intervention.

Finally, it is not clear whether imagining oneself forgiving is the same thing as actually forgiving or whether they would produce different results. This limitation is common across the field (10,22,23) and calls into question whether the results are truly generalizable. Still, in our study, even imagining forgiving resulted in reduced CVR during subsequent rumination on the event, suggesting that imagining oneself forgiving can yield cardiovascular benefits. In addition, it would also be useful to replicate the current findings with a sample from the general population because the current sample comprised

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undergraduates, who may not be representative in the interpersonal offenses they experience, and was mostly women, who tend to be more forgiving than men.

The reactivity hypothesis suggests that small changes in CVR like those seen here can build up over time and result in differences in health outcomes (16). However, additional research is needed to determine whether modest differences in the laboratory over a short period could translate to actual differences in health outcomes. Our results do suggest a possible mechanism for health differences associated with forgiveness and indicate that, although forgiveness is often assumed to benefit offenders, it seems that those who forgive can also experience concrete benefits for themselves.

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*implications for self-forgiveness*

*- how different from compassion.*

