





indices of overall severity of exposure to stress, but also assessed these effects using 20 different subdomain indices of stress exposure across 2 time periods (i.e. early life, adulthood), 2 stressor types (i.e. acute, chronic), 11 life domains (e.g. housing, education, work, etc.), and 5 different social–psychological characteristics (e.g. interpersonal loss, physical danger, humiliation, etc.). Second, we hypothesized that greater forgivingness would be associated with better mental and physical health. Finally, we hypothesized an interaction between severity of lifetime stress exposure and forgivingness, such that higher levels of forgivingness would buffer the negative effects of stress severity across all domains on mental and physical health symptoms.

## Method

### *Participants and procedures*

Participants were 148 young adults recruited from a mid-sized liberal arts college campus in the Midwest. Most of the participants (99%) began college in the past 4 years. The sample was 54 percent women, with a mean age of 19.32 years (standard deviation (*SD*)=2.80). Less than 1 percent of participants were married, 29 percent were in a serious relationship, 12 percent were dating, and 60 percent were single. Over 99 percent had no children. Participants provided written informed consent and completed all of the measures online for course credit. Finally, all study procedures were approved by the local Institutional Review Board.

### *Measures*

**Lifetime stress exposure.** The STRAIN is an online stress assessment system that measures individuals' lifetime exposure to 96 different types of acute and chronic stress that affect health (Slavich and Epel, 2010; see <http://www.uclastresslab.org/STRAIN>). The system combines the reliability and sophistication of an interview-based measure of stress with the simplicity of a self-report instrument. Questions

appear on the computer screen, and for each endorsed stressor, users are asked a series of follow-up questions that ascertain the severity, frequency, timing, and duration of the stressor. Example items are, "Have you ever found out that a partner was unfaithful to you?" and "Have you ever looked for a job for at least six months, but were unable to find a stable job?" The validity of this question set has been demonstrated in the context of predicting metabolic health (Kurtzman et al., 2012), cancer-related fatigue (Bower et al., 2014), and psychological and physical health (Slavich and Epel, in preparation). Lifetime stressor "count" can range from 0 to 96 and cumulative "severity" can range from 0 to 480, with higher scores representing higher stressor count and severity, respectively.<sup>1</sup> In addition, 20 subscale scores can be computed to index stress exposure occurring across 2 time periods (early life, adulthood), 2 stressor types (acute, chronic), 11 life domains (housing, education, work, treatment/health, marital/partner, reproduction, financial, legal/crime, death, life-threatening situations, and possessions), and 5 social–psychological characteristics (interpersonal loss, physical danger, humiliation, entrapment, and role change).

**Forgivingness.** The Heartland Forgiveness Scale (HFS) is an 18-item measure of forgivingness, which assesses the general disposition toward engaging in all types of forgiveness. Responses are given on a 1 (*almost always false of me*) to 7 (*almost always true of me*) scale, and scores can range from 18 to 125, with higher scores representing more forgivingness. Psychometric work on the HFS shows acceptable confirmatory factor analyses, convergent/divergent validity, and internal and test–retest reliability (Thompson et al., 2005). Internal consistency for the HFS for this study was excellent ( $\alpha = .90$ ).

**Mental health symptoms.** The Kessler 6 (K6) measures nonspecific psychological distress. Responses are given on a 1 (*never*) to 5 (*very often*) scale, and scores can range from 6 to 30, with higher scores representing more distress.

The K6 possesses excellent psychometric properties (Kessler et al., 2002, 2010). Internal consistency for the K6 for this study was excellent ( $\alpha = .90$ ).

**Physical health symptoms.** The 14-item Physical Health Questionnaire (PHQ) assesses somatic symptoms (Spence et al., 1987). Responses to 12 items are given on a 1 (*not at all*) to 7 (*all the time*) scale, and responses to 3 items are given on a 0 *times* to 7+ *times* scale. Scores range from 14 to 98, with higher scores representing more physical health symptoms. Psychometric work on the PHQ shows acceptable exploratory and confirmatory factor analysis, excellent convergent/divergent validity, and strong internal consistency (Schat et al., 2005). Internal consistency for the PHQ for this study was good ( $\alpha = .82$ ).

## Analyses

Preliminary analyses included descriptive statistics and bivariate correlations for all study variables. Primary analyses included hierarchical regression models that examined direct and interactive effects of lifetime stress severity and forgiveness on health. Life stress and forgiveness were entered as direct effects on Step 1, and the Life Stress  $\times$  Forgiveness interaction effect was entered in Step 2.<sup>2</sup> Simple slopes analyses followed guidelines described by Cohen et al. (2003). These analyses involved examining the effects of life stress on health at low, moderate, and high levels of forgiveness. Data were examined for adherence to assumptions, and the alpha level was set at  $p < .05$ .

## Results

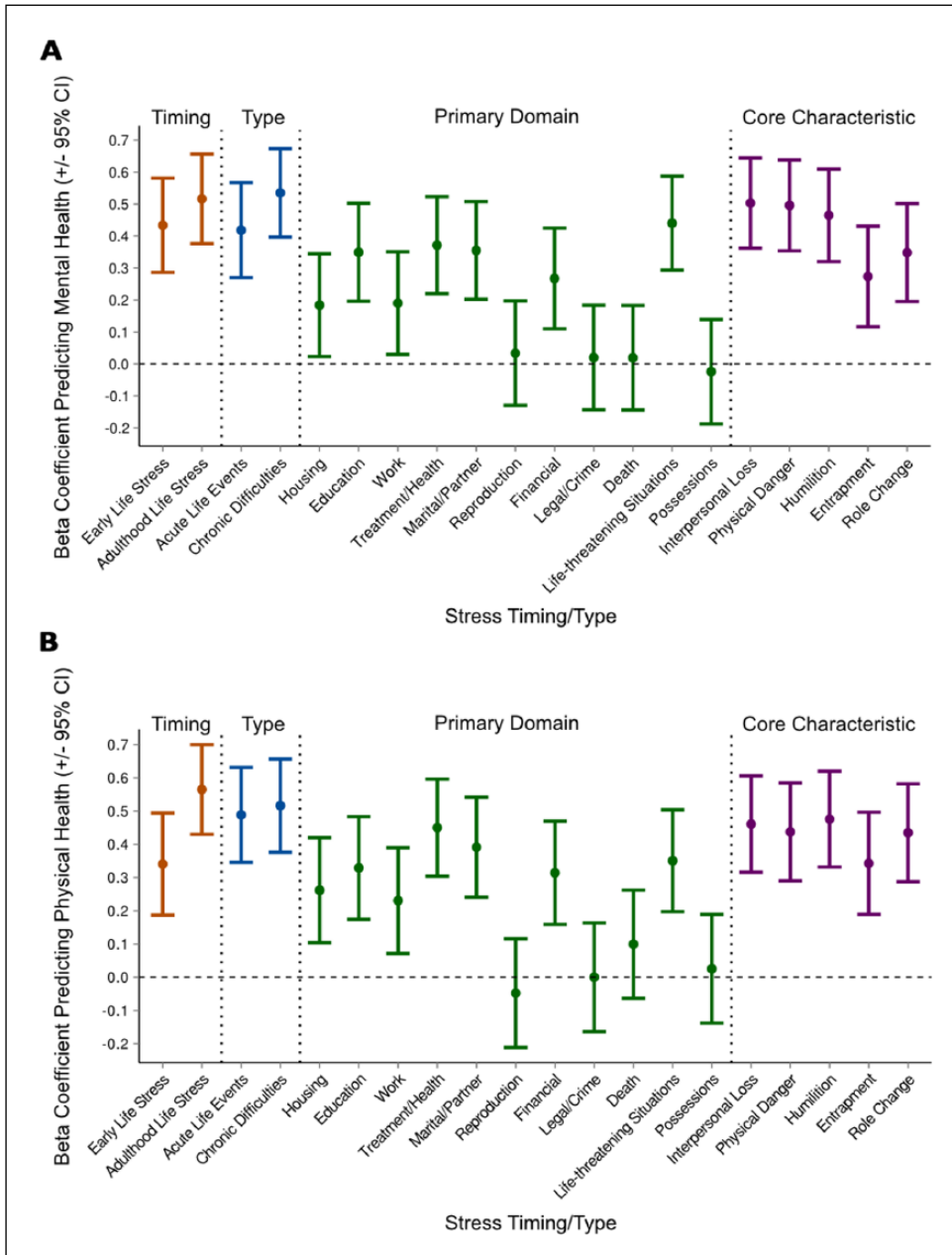
### Preliminary analyses

On average, participants experienced nearly 13 major life stressors each and rated those stressors as being moderately stressful ( $M = 3.08$ ; range = 1–5). Participants reported levels of overall forgiveness that were relatively high ( $M = 87.56$ ,  $SD = 15.20$ ), and a moderate number of mental ( $M = 13.91$ ,  $SD = 5.24$ ) and physical

health symptoms ( $M = 35.65$ ,  $SD = 11.29$ ). The most frequently reported stressors involved keeping up with the demands of college, death of a close friend or loved one, isolation and loneliness, relationship difficulties, and financial problems. In bivariate analyses, most of the 20 stress severity indices were strongly associated with poorer health. As shown in Figure 1, only reproductive-, legal/criminal-, death-, and theft-related stressors were unrelated to health. Given the consistency across stress indices, subsequent analyses utilized total stress severity score as the main stress variable. Greater total lifetime stressor severity was strongly associated with having more mental ( $r = .54$ ,  $p < .001$ ) and physical ( $r = .55$ ,  $p < .001$ ) health symptoms. In contrast to stress, forgiveness was negatively related to mental ( $r = -.48$ ,  $p < .001$ ) and physical health symptoms ( $r = -.35$ ,  $p < .001$ ). Additionally, greater lifetime stress severity was negatively related to forgiveness ( $r = -.26$ ,  $p < .01$ , and  $r = -.33$ ,  $p < .001$ , respectively). As expected, participants experiencing more mental health symptoms also experienced more physical health symptoms ( $r = .56$ ,  $p < .001$ ).

### Primary analyses

**Lifetime stress severity, forgiveness, and mental health.** As hypothesized, forgiveness significantly moderated the effects of lifetime stress severity on mental health ( $\beta = -.173$ ,  $p < .01$ ; see Table 1, Mental Health Model 2). Planned simple slopes analyses revealed a graded moderating effect of forgiveness on mental health symptoms. Specifically, participants with low levels of forgiveness (1.5 *SDs* or more below the mean) showed the strongest associations between lifetime stress severity and mental health symptoms ( $\beta = 0.68$ ,  $p < .05$ ), followed by participants exhibiting moderate amounts of forgiveness (within 1.5 *SDs* of the mean) ( $\beta = 0.41$ ,  $p < .05$ ), and finally by participants with high levels of forgiveness (1.5 *SDs* or more above the mean) ( $\beta = 0.15$ ,  $p > .05$ ). This graded interaction effect is depicted graphically in Figure 2. Also as hypothesized, lifetime stressor severity and forgiveness were both uniquely associated with



**Figure 1.** Associations between severity of lifetime stress exposure and (a) mental and (b) physical health symptoms, categorized by stressor timing, type, primary domain, and core social-psychological characteristic. Error bars represent 95 percent confidence intervals ( $N = 148$ ).

mental health symptoms, with greater lifetime stress severity predicting more mental health symptoms ( $\beta = 0.42, p < .001$ ) and higher levels

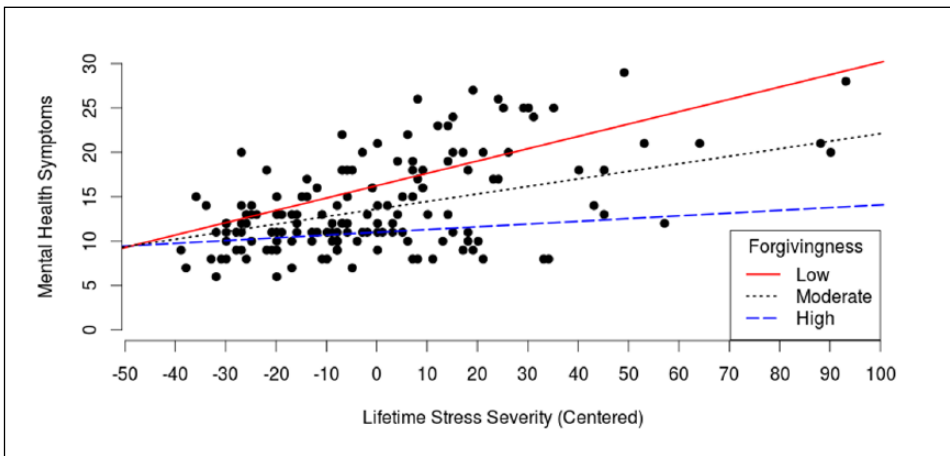
of forgiveness predicting fewer mental health symptoms ( $\beta = -0.34, p < .001$ ) (see Table 1, Mental Health Model 1).

**Table 1.** Hierarchical regression analysis examining direct and interactive effects of lifetime stress severity and forgiveness on mental and physical health symptoms.

Predictor	Mental health						Physical health					
	Model 1			Model 2			Model 1			Model 2		
	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$	B	SE B	$\beta$
Lifetime Stress Severity	0.09	0.01	0.42***	0.29	0.07	0.42***	0.22	0.03	0.49***	0.27	0.17	0.49***
Forgivingness	-2.14	0.43	-0.34***	-0.33	0.76	-0.34**	-2.58	0.96	-0.19**	-2.11	1.76	-0.19**
Lifetime Stress Severity × Forgivingness				-0.043	0.02	-0.17**				-0.01	0.04	-0.02
R <sup>2</sup>	.39***			.42***			.34***			.34***		
F for $\Delta R^2$	46.63***			8.11**			36.96***			0.10		

SE: standard error.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , two-tailed ( $N = 148$ ).



**Figure 2.** Associations between severity of lifetime stress exposure, forgiveness, and mental health. As hypothesized, greater lifetime stress severity uniquely predicted more mental health symptoms, and higher levels of forgiveness uniquely predicted fewer mental health symptoms. In addition, there was a strong graded Lifetime Stress Severity × Forgivingness interaction effect, demonstrating that forgiveness significantly buffers the effects of lifetime stress severity on mental health ( $N = 148$ ).

*Lifetime stress severity, forgiveness, and physical health.* Next, the effects of lifetime stress severity and forgiveness on physical health symptoms were examined. Contrary to our hypothesis, forgiveness did not moderate the effects of cumulative lifetime stress severity on physical health ( $\beta = -0.02, p > .05$ ; see Table 1, Physical Health Model 2). As hypothesized, lifetime stressor severity and forgiveness were both uniquely associated with physical health symptoms, with greater lifetime stress

severity predicting more physical health symptoms ( $\beta = 0.49, p < .001$ ) and higher levels of forgiveness predicting fewer symptoms ( $\beta = -0.19, p < .01$ ; see Table 1, Physical Health Model 1).

### Discussion

Although early and adulthood life stress are known to be strongly associated with a broad range of mental and physical health problems

(Cohen et al., 2007; Conway et al., 2014; Slavich and Irwin, 2014; Taylor, 2010), few studies have actually measured the severity of lifetime exposure to stress and examined its effects on health. Moreover, the coping styles that might moderate such effects remain unclear. We addressed these important issues by studying 148 young adults who were well characterized with respect to their lifetime stress exposure history, tendency to employ the coping style of forgiveness, and recent mental and physical health symptoms. Consistent with prior work on early and adulthood life stress and health (Cohen et al., 2007; Graham et al., 2006; Lupien et al., 2009; Pearlin et al., 2005), we found that greater stress exposure severity over the lifespan was associated with poorer mental and physical health. These effects were robust while controlling for mental health symptoms in the physical health models, and vice versa, and were present for most of the 20 different stress severity indices that we calculated using the STRAIN.

Hypotheses regarding relations between forgiveness and mental and physical health were based on research showing that people with coping styles involving forgiveness have better overall health (Toussaint and Webb, 2005; Worthington et al., 2007). The present data are consistent with this research, but show for the first time that forgiveness is a strong, independent predictor of mental and physical health while controlling for the effects of lifetime stress severity on health. Prior research has shown that associations between forgiveness and health are substantially attenuated or eliminated while controlling for perceptions of stress (Lawler et al., 2005). However, it is possible that a side effect of higher forgiveness is reduced perceptions of stress. By measuring actual lifetime stress severity and not merely levels of general perceived stress, the present findings offer new insight into how the effects of stress might be offset by the *independent* effects of forgiveness.

That forgiveness predicts mental and physical health over and above stress severity dovetails with intervention work showing that

facilitating experiences of forgiveness improves mental and physical health (Baskin and Enright, 2004; Wade et al., 2005; Waltman et al., 2009). As such, personally cultivating this emotion-focused coping style may offer health benefits independent of the life stressors that an individual might face. To the extent that forgiveness training can promote a more forgiving coping style, then these interventions may help reduce stress-related disease and improve human health. Such interventions may be particularly beneficial when delivered as a prevention strategy in early life, before individuals are exposed to major adulthood life stressors and before disease processes have begun to take hold.

This study also examined whether forgiveness moderates the effects of lifetime stress severity on health. Existing research in this area has evaluated whether perceived stress mediates the effects of forgiveness on health, and how forgiveness mediates the relation between stress and health. Additionally, both theory and research suggest that forgiveness may *moderate* the effects of stress on health by acting as an important coping style (Strelan and Covic, 2006; Worthington, 2003; Worthington and Scherer, 2004). To our knowledge, however, no studies to date have examined whether forgiveness moderates the effects of stress on health. Here, we demonstrated for the first time that forgiveness does buffer the negative effects of lifetime stress severity on mental health, and that this moderation occurs in a graded fashion. Specifically, we found that lifetime stress severity was unrelated to mental health for persons who were highest in forgiveness, significantly associated with poorer mental health for persons exhibiting moderate levels of forgiveness, and most strongly related to poorer mental health for participants exhibiting the lowest levels of forgiveness.

The present data do not reveal *how* forgiveness buffers the effects of lifetime stress severity on mental health, but several explanations are possible. First, more forgiving individuals may have a more adaptive or extensive repertoire of coping strategies that mitigate the negative effects of stress on health. Consistent









