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Whatever Does Not Kill Us: Cumulative Lifetime Adversity, Vulnerability, and Resilience

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Exposure to adverse life events typically predicts subsequent negative effects on mental health and well-being, such that more adversity predicts worse outcomes. However, adverse experiences may also foster subsequent resilience, with resulting advantages for mental health and well-being. In a multiyear longitudinal study of a national sample, people with a history of *some* lifetime adversity reported better mental health and well-being outcomes than not only people with a *high* history of adversity but also than people with *no* history of adversity. Specifically, U-shaped quadratic relationships indicated that a history of some but nonzero lifetime adversity predicted relatively lower global distress, lower self-rated functional impairment, fewer posttraumatic stress symptoms, and higher life satisfaction over time. Furthermore, people with some prior lifetime adversity were the least affected by recent adverse events. These results suggest that, in moderation, whatever does not kill us may indeed make us stronger.

Keywords: cumulative lifetime adversity, resilience, stress inoculation, toughening, mental health and well-being

Despite the familiarity of the adage that whatever does not kill us makes us stronger, the preponderance of empirical evidence seems to offer little support for it. Histories of a given adverse event (e.g., physical/sexual assault, parental loss, homelessness, natural disasters) have all been associated with poorer mental health outcomes (e.g., Edwards, Holden, Felitti, & Anda, 2003; Emery & Laumann-Billings, 1998; Golding, 1999; Kendall-Tackett, Williams, & Finkelhor, 1993). When adversities occur, their negative effects can be long lasting. For example, disability and unemployment have predicted lower life satisfaction that persisted over at least several years (Lucas, 2007; Lucas, Clark, Georgellis, & Diener, 2004). People can also recover quickly from an adverse event or avoid severe disruption from it altogether (e.g., Bonanno, Wortman, et al., 2002; Bonanno, Moskowitz, Papa, & Folkman, 2005; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Wortman & Silver, 1989), but mitigated negative consequences in the near term do not necessarily contribute to building future resilience to adversity. Nonetheless, in addition to the aforementioned adage, theoretical and empirical work does suggest that under the proper conditions, experiencing life adversity may foster subsequent resilience. We sought to test this possibility in the current investigation.

The Role of Adversity in Fostering Subsequent Resilience

Resilience has been defined as successful adaptation or the absence of a pathological outcome following exposure to stressful or potentially traumatic life events or life circumstances. Thus, it involves both the capacity to maintain a healthy outcome following exposure to adversity and the capacity to rebound after a negative experience (Rutter, 2007; Silver, 2009). Consistent with this definition, part of our focus is on understanding the factors that contribute to resistance to the potential negative effects of relatively major adverse events. Although adversity can have negative effects on people's mental health and psychological well-being, this does not occur for everyone, nor necessarily for an interminable duration (Silver & Wortman, 1980; Wortman & Silver, 1989). In fact, early research in child psychiatry suggests that resilience is a common, rather than an extraordinary, phenomenon (Rutter, 1985), even in the context of substantial adversity (e.g., Masten, 2001; Werner & Smith, 1992). Most people experience some serious adversity in their lives (Bonanno, 2004); in the absence of resilience or reparative mechanisms, this could seemingly lead people to experience ongoing psychological distress, yet most people do not live in such a chronic state. Gilbert et al. (1998) suggested that a psychological immune system works to actively dispel negative affect when people experience it. This promotes a faster and easier return to baseline than individuals predict for themselves in the face of a negative event.

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There is an important distinction, however, between recovering back to baseline functioning (or largely avoiding decrements entirely) after a negative event and deriving from it a greater capacity for future resilience. Drawing on human and animal literature, Dienstbier's (1989, 1992) theory of psychophysiological toughness provides an account that explains why facing adversity may foster subsequent resilience. Similar ideas have been referred to by others as stress inoculation (e.g., Lyons & Parker, 2007; Meichenbaum, 1993), steeling (e.g., Rutter, 2006), thriving (e.g., Carver, 1998), and immunization (e.g., Basoglu et al., 1997). Dienstbier argued that exposure to stressors has a positive toughening effect when the exposure is limited, with an opportunity for recovery. Toughness leaves individuals more likely to appraise situations positively (i.e., perceiving them as more manageable), more emotionally stable, and better able to cope psychologically and physiologically with difficult stressors and minor challenges, relative to nontoughened individuals. Once toughness develops, it can permeate across domains.

This is consistent with theories of anxiety that emphasize mastery and control (Chorpita & Barlow, 1998; Mineka & Zinbarg, 2006). Early life experience of low perceived control and low mastery facilitates interpreting subsequent situations as uncontrollable. In contrast, the experience of high control and high mastery has the opposite effect, facilitating future perceptions of control, which in turn can enhance coping capabilities. For example, infant monkeys who had the opportunity to control aspects of their environment during development (i.e., delivery of food and water) later exhibited less fear and more exploratory behavior than did monkeys who lacked such opportunity to exert control (Mineka, Gunnar, & Champoux, 1986). Coping with some amount of stress could similarly promote perceptions of control and mastery. Thus, mastery and toughness should substantially overlap; across both perspectives, coping with stressors may promote subsequent benefits.

It is important to note that Dienstbier (1989, 1992) further argued that both sheltering from all stressors and continuous exposure to stressors leads to lack of toughness. Although sheltering from stressors may temporarily protect against distress, it should not result in long-term advantages. Sheltering provides no opportunity to develop toughness and mastery and is unlikely to persist indefinitely, so when stressors are eventually encountered, individuals are likely to be ill equipped to cope with them. For example, in the face of work stressors in young adulthood, individuals who experienced prior work stress during adolescence did not exhibit the negative effects on self-esteem, self-efficacy, and depressed mood shown by individuals with little prior work stress (Mortimer & Staff, 2004). The development of toughness and mastery is analogous to the development of physical fitness from aerobic exercise: Excessive exercise exerts a harmful toll on the body, but fitness does not improve with inactivity.

Evidence also suggests that exposure to moderate levels of adversity can predict better mental health and well-being than exposure to either a high level of adversity or to no adversity. Specifically, among Vietnam War veterans, Schnurr, Rosenberg, and Friedman (1993) reported that peripheral exposure to combat predicted improvements in psychological functioning (i.e., Minnesota Multiphasic Personality Inventory scores) from pre- to postmilitary service, relative to veterans with both no exposure and direct exposure to combat. Similarly, Fontana and Rosenheck (1998) found an inverse U-shaped quadratic relationship when degree of perceived threat from combat and degree of exposure to death of others were used to predict self-reported psychological benefits among veterans, such that moderate threat and exposure predicted the greatest benefits.

Additional findings support the proposition that moderate levels of adversity can contribute to nonspecific resilience to subsequent stressors. In experimental studies, young monkeys exposed to an intermittent stressor during development demonstrated greater resilience to subsequent novel stressors than did monkeys without any exposure (Parker, Buckmaster, Schatzberg, & Lyons, 2004; Parker, Buckmaster, Sundlass, Schatzberg, & Lyons, 2006). In humans, children with moderate levels of early life adversity exhibited lower cortisol activity than did others during a laboratory stressor (Gunnar, Frenn, Wewerka, & Van Ryzin, 2009), a response potentially consistent with Dienstbier's (1989, 1992) toughened physiological pattern.

In sum, resilience in response to adversity has been documented in research spanning a variety of populations over the past several decades. Although many researchers have sought to understand personal characteristics or qualities that promote resilience, the potential benefits of exposure to some adversity relative to no adversity have received less attention. The reviewed theory and findings suggest that adversity has the potential to foster future resilience. Specifically, without adversity, individuals are not challenged to manage stress, so that the toughness and mastery they might otherwise generate remains undeveloped. High levels of adversity, on the other hand, are more likely to overwhelm individuals' ability to manage stress, thereby disrupting toughness and mastery. However, low/moderate adversity provides a more manageable challenge than high levels of adversity, thus promoting the development of toughness and mastery. This toughness and mastery, in turn, should facilitate (a) greater resilience, manifested as a less negative response when coping with subsequent adversity, and (b) better mental health and well-being over time, regardless of exposure to recent adversity.

Cumulative Adversity

Much research investigating life adversity focuses on single events (e.g., reactions to a divorce) or single types of events (e.g., prior combat experience vs. not). However, adversities often cooccur (Dong et al., 2004; Green et al., 2010), making it difficult to isolate the impact associated with any single event, especially over a lifetime. Furthermore, a given type of event can have general effects across domains of psychological functioning, thus overlapping with the effects of other adversity types (McMahon, Grant, Compas, Thurm, & Ey, 2003). Such findings suggest the merits of attempting to assess individuals' overall history of adversity. This has led to measurement of cumulative adversity—the total amount of adversity experienced by a person—which has also been associated with negative outcomes. Assessments of cumulative adversity typically involve counts of negative events experienced over a period of time (e.g., one's lifetime). Increases in the nonspecific total predict incrementally worse outcomes, including greater psychiatric symptoms and disorder risk (e.g., Breslau, Chilcoat, Kessler, & Davis, 1999; Cabrera, Hoge, Bliese, Castro, & Messer, 2007; Turner & Lloyd, 1995, 2004) and greater risk behavior and physical disease (Felitti et al., 1998; Sledjeski, Speisman, &

Dierker, 2008). It is important to note that adversities that fail to meet typical definitions of "trauma" nonetheless contribute to predicting psychiatric disorder onset (Lloyd & Turner, 2003) and symptoms (Galea et al., 2008; Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002).

As described above, experiencing low levels of adversity should be most likely to foster mastery and toughness, thereby leading to subsequent resilience. In terms of cumulative lifetime adversity, a low level of adversity should equate to a low but nonzero number of total lifetime adverse events. The specific characteristics of given events could certainly vary across individuals on dimensions relevant for developing mastery and toughness, but on average, a low but nonzero total count should be most likely to lead to subsequent mastery and toughness. Any measure of adversity must be sensitive enough to differentiate low adversity from a history of no adversity and a history of high adversity, both of which should promote less mastery and toughness than low adversity. This should yield a quadratic, curvilinear relationship between continuous cumulative adversity count and outcome measures. Consistent with prior evidence for linear relationships in which greater cumulative adversity predicts worse outcomes, an overall linear trend in this direction could still emerge, but with a reversal of this relationship between no adversity and low adversity (cf. May & Bigelow, 2005). Whereas the precise number of events that is optimally "low" is not particularly meaningful for testing hypotheses, establishing the presence of such a reversal within the sample's range is crucial.

Quadratic effects of lifetime adversity have rarely been tested (Schilling, Aseltine, & Gore, 2008). If high adversity predicts the worst outcomes, an expected linear relationship could easily emerge and limit further investigation (May & Bigelow, 2005). Moreover, measures of cumulative adversity commonly assess only a few types of stressors and often exclude multiple instances of the same type, thereby limiting measurement sensitivity. The fewer adversities measured, the more likely that people with histories of no adversity and low adversity will show the same total, thereby obscuring the critical differences between them.

Hypotheses

We expected that low levels of cumulative lifetime adversity would predict greater resilience than having experienced no prior adversity or high levels of adversity. Using a national survey panel (N = 2,398) assessed repeatedly from 2001–2004, we tested for quadratic relationships between lifetime adversity and a variety of longitudinal measures of mental health and well-being: global distress, functional impairment, posttraumatic stress symptoms, and life satisfaction. We generated two specific hypotheses:

Hypothesis 1: Cumulative lifetime adversity was expected to predict subsequent mental health and well-being outcomes in a quadratic fashion, such that a history of low adversity would predict better outcomes than histories of no or high adversity. This is consistent with the reasoning that low levels of prior adversity should be most likely to foster toughness and mastery. Because toughness and mastery should generalize across domains and facilitate coping with both large and small stressors, recent life adversity need not have occurred to elicit this pattern of results.

Hypothesis 2: Cumulative lifetime adversity was expected to moderate the relationship between recently experienced major adversity and subsequent mental health and well-being outcomes in a quadratic fashion, such that low prior lifetime adversity would protect against the negative effects of recent adversity, relative to no and high prior lifetime adversity. In other words, low lifetime adversity should predict resilience in the face of recent adversity.

Method

Data Collection

The sample was drawn from a nationally representative Web-enabled research panel established by Knowledge Networks, Inc. (KN). Panel members were randomly selected to participate in our research (Holman et al., 2008; Silver et al., 2002; Silver et al., 2006). The KN panel is developed using traditional probability methods for creating national survey samples and, at the time of our study, was recruited using stratified random-digit-dial telephone sampling. Random-digit-dial sampling provides a known nonzero probability of selection for every U.S. household having a telephone. The distribution of the KN panel closely tracks the distribution of census counts for the U.S. population on age, race, Hispanic ethnicity, geographical region, employment status, income, and education. To ensure representation of population segments that would not otherwise have Internet access, KN provided panel households with an Internet connection and Web TV to serve as a computer monitor. Panel members participate in brief Internet surveys three to four times a month in exchange for free Internet access or other compensation if the household is already Web-enabled. Unlike typical Internet panels, in which people who already have Internet access choose to opt in, no one can volunteer for the KN panel.

When members are assigned a survey, they receive notice of its availability in their individual password-protected e-mail accounts. Surveys are confidential, self-administered, and accessible any time for a designated period; panelists can complete a survey only once. Responding to any given survey is voluntary, and the provision of Internet service is not dependent on completion of any specific survey. Even though panel members complete surveys regularly, there are no significant differences over time in responses given by "seasoned" participants from "naïve" ones (Dennis, 2001).

Design

Starting in September, 2001, our research team collected longitudinal data from a national sample of the adult U.S. population randomly selected from the KN panel (Holman et al., 2008; Silver et al., 2002, 2006). A total of 2,398 respondents reported their lifetime exposure to negative events and some outcome measures. The sample closely resembled the national population.

Data collection for the current analyses occurred at five points: when respondents entered the KN panel (prior to September, 2001), Wave 1 (around September, 2002), Wave 2 (around March, 2003), Wave 3 (around September, 2003), and Wave 4 (around September, 2004). All initial assessments were administered by KN online; subsequent surveys were administered by KN online or

via paper-and-pencil surveys mailed to respondents if they had already left the KN panel. Additional waves of data were collected on subsamples of these respondents before Wave 1 (see Silver et al., 2006); because these waves provide restricted sample sizes and are not relevant for current analyses, they are not discussed further.

Measures

Background characteristics and individual differences. KN administered several surveys to panelists upon entry into the KN panel, including a demographic questionnaire and a mental and physical health history. Demographic information collected included gender, ethnicity (U.S. Census categories), age, income, marital status, household size (coded 1 if living alone, 0 if not), and education. An index of physician-diagnosed mental health problems with values of 0 (*no diagnoses*) or 1 (*depression, anxiety, or both*) and a count of 35 physician-diagnosed physical health ailments were created. At Wave 1, respondents reported their current employment status, coded as 1 if they endorsed being currently employed (i.e., paid employee, self-employed, owner/partner in small business/practice/farm, or working at least 15 hr per week without pay in family business/farm) and 0 if they chose any of the other five possible options (i.e., unemployed but looking for work, retired, disabled, homemaker, or other). At Wave 2, respondents completed the Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003), a brief measure of the Big Five personality dimensions (e.g., McCrae & Costa, 1999; 1–7 response scale).

Cumulative lifetime adversity. By Wave 1, lifetime exposure to cumulative adversity was assessed by asking respondents whether they ever experienced each of 37 negative events and the age(s) at which they occurred. The list of events included seven categories: own illness or injury, loved one's illness or injury, violence (e.g., physical assault, forced sexual relations), bereavement (e.g., parent's death), social/environmental stress (e.g., serious financial difficulties, lived in dangerous housing); relationship stress (e.g., parents' divorce); and disaster (e.g., major fire, flood, earthquake, or other community disaster). The measure was modified from the Diagnostic Interview Schedule trauma section (Robins, Helzer, Croughan, Williams, & Spitzer, 1981), expanded to include a wider variety of stressful events using primary care patients' reports of lifetime stress (Holman, Silver, & Waitzkin, 2000), and has provided rates of negative events comparable to those in other community samples (Breslau et al., 1998; Kessler, Sonnega, Bromet, & Nelson, 1995). Up to four instances of each event were tallied, regardless of duration. We treated the total number of instances of adversity as a continuous variable.

Recent adversity. At Wave 2, respondents reported their exposure to the same list of negative events over the previous 6 months only. Events reported at this assessment were distinct from those included in respondents' assessment of lifetime adversity. We treated the total number of recent events as a continuous variable.

Mental health and well-being. Respondents completed outcome measures at Waves 1–4. Measures assessed four aspects of mental health and well-being. *Global distress* was assessed using the Brief Symptom Inventory ($\alpha = .92$ to .93; 0–4 response scale), a well-validated standardized scale that measures prior-week symptoms of psychological distress (depression, anxiety, and somatization; Derogatis, 2001). *Functional impairment* was assessed with four items adapted from the SF–36 Health Survey (i.e., extent physical/emotional health interfered with social/work activities; $\alpha = .85$ to .87; 1–5 response scale; Ware & Sherbourne, 1992). *Life satisfaction* was assessed with a five-item scale ($\alpha = .90$ to .93; 1–7 response scale; Diener, Emmons, Larsen, & Griffin, 1985). *Posttraumatic stress (PTS) symptoms* were assessed using the PTSD Checklist (PCL; $\alpha = .92$ to .94; 1–5 response scale; Weathers, Litz, Herman, Huska, & Keane, 1993). Unlike our other measures of mental health and well-being, PTS symptoms were assessed specifically in reference to a recent collective trauma—the terrorist attacks of September 11, 2001 (9/11)—that generated psychological responses nationwide, including among people who were not directly exposed (Silver et al., 2002, 2006). Given findings demonstrating that PTS symptoms in response to a prior event can be exacerbated by other negative events (i.e., recent events; Classen et al., 2002), we expected the same pattern of results for PTS symptoms as the other outcome measures.

Covariates in supplementary analyses. In primary analyses, statistical models did not include covariates. However, to provide evidence that any observed effects were not attributable to demographic and other characteristics, we repeated analyses controlling for the following: gender, ethnicity, age, income, marital status, household size, education, employment status, mental and physical health history, and degree of exposure to the 9/11 attacks (particularly relevant for the measure of PTS symptoms). We accounted for degree of exposure to the attacks using items modified from prior research on disaster exposure (Holman & Silver, 1998; Koopman, Classen, & Spiegel, 1994). Individuals were categorized into three levels: direct exposure (in the World Trade Center or Pentagon, seeing or hearing the attacks in person, or having a close relationship with someone in the targeted buildings or airplanes), live media exposure (watching the attacks on television *live as they occurred*), or no live exposure (seeing video replay or learning of the attacks *only* after they had occurred). We included these covariates to rule out alternative explanations based on their expected association with adversity (e.g., health history) and subsequent mental health and well-being (e.g., 9/11 exposure). This created a conservative test, in that only the unique relationships between adversity and mental health were tested for significance. To the extent that analyses with and without covariates yield comparable results, it should increase confidence in interpreting our findings. Analyses without these covariates are reported in detail and presented in the tables and figures. The pattern of results remained consistent when including covariates, which is summarized in the Supplementary Analyses sections.

Analytic Strategy

Repeated-measures approach. Analyses were conducted with generalized estimating equations (GEE), a population-averaged analysis appropriate for repeated-measures longitudinal data that accommodates missing assessments and provides necessary adjustments of standard errors. The analysis yields a single significance test for each predictor across all assessments of a given outcome variable. Appropriate for our research question, GEE focuses on between-subject effects (i.e., differences between respondents with different levels of cumulative adversity), rather than within-subject effects (i.e., trajectories within individuals over time). Coefficients from GEE models thus have analogous meaning to

coefficients from standard multiple regression. Analyses were conducted with STATA 9.2 (StataCorp, College Station, TX), specifying the robust option and including dummy-coded variables representing assessment wave. In addition to quadratic and interaction terms, models included appropriate linear and other component terms.

Transformations. The following variables were highly positively skewed: physical health diagnoses (included only in covariate analyses), lifetime and recent adversity counts, and all outcome variables except life satisfaction. In primary analyses, inverse or natural logarithmic transformations were performed on these variables to create distributions that more closely approximated normal and to decrease the influence of extreme scores (Tabachnick & Fidell, 1996). To confirm that transformations did not create spurious nonlinear relationships, we conducted supplementary analyses using (a) untransformed outcome variables; (b) recoded untransformed lifetime adversity, setting the most extreme cases (approximately 10% with adversity count greater than 15) to 15, thus addressing extreme scores without altering data at low levels of adversity, which were most important for our hypotheses; and, for Hypothesis 2, (c) dichotomized recent adversity count (experienced one or more events vs. none; it was otherwise continuous), which similarly addressed extreme scores, given that recent adverse events were relatively low in frequency compared with lifetime adverse events. Analyses using transformed variables are reported in detail and presented in the tables and figures. The pattern of results remained consistent using untransformed variables; these findings are summarized in the Supplementary Analyses sections.

Coefficient reporting. To make results more interpretable, adversity counts were divided by their standard deviations ($SD = 1$) and outcome variables were converted to z scores ($M = 0$, $SD = 1$) using the standard deviation of all observations across all waves of data collection. Coefficients thus reflect effect sizes in units of standard deviations: Bs represent the number of standard deviations of change in the outcome variable predicted for each standard deviation change in the predictor. Because GEE uses maximum likelihood estimation, traditional measures of effect size based on variance accounted for cannot be calculated.

Prospective tests. To create prospective tests, our models included outcome variables measured in waves subsequent to those in which predictors were assessed. This helped to rule out the possibility that observed relationships could be explained by contemporaneous reporting of predictors and outcomes. Analyses testing Hypothesis 1 (i.e., those that did not include recent adversity) used assessments from Waves 2–4 as outcome variables. When testing Hypothesis 2 (i.e., moderation of recent adversity), we included recent events assessed only at Wave 2 as a predictor and outcomes from only Waves 3–4. Thus, lifetime adversity (from Wave 1), recent adversity (Wave 2), and outcomes (Waves 3–4) were measured at distinct times.

Results

Sample Characteristics

At the start of the study, the sample ranged in age from 18 to 101 years old ($M = 49.3$, $SD = 16.1$) and was 51.3% female. Almost 74% of the sample self-identified as White (non-Hispanic), 10.0% as Hispanic, 8.7% as African American (non-Hispanic), and 7.4% as "other," which included Asian. Median household income was \$40,000–\$49,999. Approximately 63% of the sample was married, 15.7% was divorced or separated, 14.6% was single, and 7.1% was widowed. Almost 15% of the sample lived alone. Just over 8% of the sample attained less than a high school degree, 33.7% held a high school degree, 29.7% attended some college, and 28.5% held a college or advanced degree. Approximately 62% of the sample was employed (see Table 1 for a correlation matrix).

The total number of lifetime adverse events experienced ranged from 0 to 71 ($M = 7.69$, $SD = 6.04$; $Mdn = 7$, interquartile range = 6); it is important to note that a nontrivial number of respondents (8.1%) reported experiencing no adverse events. Bereavement was the most frequently reported event (39.5% of all events reported by participants), followed by a loved one's illness or injury (15.0% of events reported), relationship stress (12.7%), violent events (11.4%), social/environmental stress (8.9%), own illness or injury (6.9%), and disaster (5.5%). The total number of recent adverse events (i.e., experienced during the 6 months prior to Wave 2) ranged from 0 to 9 ($M = 0.66$, $SD = 1.08$; $Mdn = 0$, interquartile range = 1).

Attrition

A substantial majority of the sample ($n = 1{,}994$, 83.2%) provided longitudinal data over Waves 2–4. To predict dropout after Wave 1, we first tested the variables that were included as covariates in supplementary analyses (gender, ethnicity, age, income, marital status, household size, education, employment status, mental and physical health history, and degree of exposure to the 9/11 attacks). In a simultaneous logistic regression model, age was the only significant predictor, such that older respondents were less likely to drop out (odds ratio [OR] = 0.966, $p < .001$). Next, in a logistic regression with linear lifetime adversity as the predictor, higher adversity was associated with lower likelihood of dropout (OR = 0.848, $p = .002$). However, when quadratic lifetime adversity was added to this model, it did not significantly predict attrition. To further evaluate whether respondents who dropped out differed from those who remained, we examined dropout with each Wave 1 outcome (global distress, functional impairment, PTS symptoms, and life satisfaction) as the predictor in a separate logistic regression. Neither Wave 1 outcomes themselves nor their interactions with linear or quadratic lifetime adversity significantly predicted attrition.

Hypothesis 1: Quadratic Cumulative Lifetime Adversity

Primary analyses. We first sought to demonstrate the typical finding for adversity: a linear effect such that a history of more lifetime adversity is associated with poorer outcomes for mental health and well-being. Effects of this nature emerged for all four longitudinal outcome variables: greater cumulative lifetime adversity predicted significantly higher global distress ($B = 0.174$, $p < .001$), functional impairment ($B = 0.136$, $p < .001$), and PTS symptoms ($B = 0.090$, $p < .001$), and significantly lower life satisfaction ($B = -0.059$, $p = .007$).

To investigate the hypothesized quadratic relationship between lifetime adversity and longitudinal outcomes, we tested models with linear and quadratic lifetime adversity terms. Consistent with

Table 1
Correlation Matrix of Lifetime Adversity Count, Age at First Adverse Event, Background Characteristics, and Wave 1 Mental Health and Well-Being Outcomes

Variable	1	2	3	4	5	6	7
1. Lifetime adversity count	—						
2. Age at first adversity	−.41***	—					
3. Female gender	.05*	−.01	—				
4. White ethnicity	.03	.05*	.00	—			
5. Age	.14***	.18***	.03	.20***	—		
6. Income	−.07**	.01	−.07***	.07**	−.09***	—	
7. Never married	−.08***	−.09***	−.03	−.12***	−.39***	−.07***	—
8. Living alone	.09***	−.02	.07**	.00	.12***	−.19***	.17***
9. College degree or higher	−.04	−.01	−.00	.03	−.06**	.27***	.02
10. Number physical health ailments	.30***	−.05*	.11***	.10***	.28***	−.06**	−.13***
11. Depression/anxiety diagnosis	.23***	−.11***	.12***	.05*	−.03	−.06**	.01
12. Currently employed	−.10***	−.06**	−.14***	−.13***	−.49***	.25***	.14***
13. Global distress	.22***	−.12***	.09***	−.06**	−.06**	−.15***	.05*
14. Functional impairment	.24***	−.08***	.07**	−.03	.03	−.19***	.01
15. Life satisfaction	−.13***	.08***	.03	.10***	.14***	.21***	−.11***
16. PTS symptoms	.16***	−.05*	.10***	−.09***	−.01	−.11***	.01
M	7.69	12.43	0.51	0.74	49.28	10.37	0.15
SD	6.04	10.53	0.50	0.44	16.09	3.90	0.35
N	2,398	2,198	2,398	2,351	2,398	2,391	2,357

Note. PTS = posttraumatic stress. The following variables were dichotomous, with the named category coded as 1 and all others coded as 0: female gender, White ethnicity, never married, living alone, college degree or higher, depression/anxiety diagnosis, and currently employed. All other variables were continuous; untransformed values are reported.
* $p < .05$. ** $p < .01$. *** $p < .001$.

predictions, results revealed significant quadratic relationships between cumulative lifetime adversity and each outcome (i.e., a significant interaction term for Lifetime Adversity × Lifetime Adversity, ps $< .001$).

Although a positive *B* coefficient for the quadratic term is consistent with a curvilinear, U-shaped curve (hypothesized for negatively valenced global distress, functional impairment, and PTS symptoms) and a negative *B* coefficient is consistent with an inverse U-shaped curve (hypothesized for positively valenced life satisfaction), these curves need not be U-shaped within the sample's range. In other words, a significant quadratic term could also reflect only the right-hand side of a U shape, such that greater lifetime adversity predicts exponentially worse outcomes, without any protective effect at low adversity relative to no adversity. Thus, to assess the extent of any protective influence of lifetime adversity, we tested the simple slope of the quadratic curve at zero, which represented a history of no adversity. This is analogous to testing simple slopes within an interaction between two variables in regression, assessing the effect of one variable at a high or low value of the other variable. Essentially treating lifetime adversity as though it was interacting with itself, we used zero adversity as the reference point to assess the momentary linear slope at that point on the quadratic curve. We chose zero as the reference point because it was within the sample's range and conceptually, the simple slope at zero most clearly represented the difference between a history of no adversity versus some adversity. As predicted, this simple slope was negative and significant for negative outcomes and positive and significant for life satisfaction (ps $< .001$): People with *low* lifetime adversity reported *better* outcomes over time than did people who had experienced *no* adversity.

To establish the reversal of this relationship, such that additional adversity predicted worse outcomes instead of better ones, we tested the simple slope at a high level of lifetime adversity. We used a relatively high value that was within the sample's range (mean + 1 *SD*; ~87th percentile) as a reference point and assessed the momentary linear slope on the quadratic curve at that point. This simple slope was significant and in the opposite direction of the no-adversity slope for all outcomes (ps $< .001$), such that *high* lifetime adversity predicted *worse* outcomes over time than did *low* adversity (see Figure 1; for statistical details, see Table 2).

Supplementary analyses. We further conducted two sets of supplementary analyses. First, when we repeated the analyses with covariates (gender, ethnicity, age, income, marital status, house-

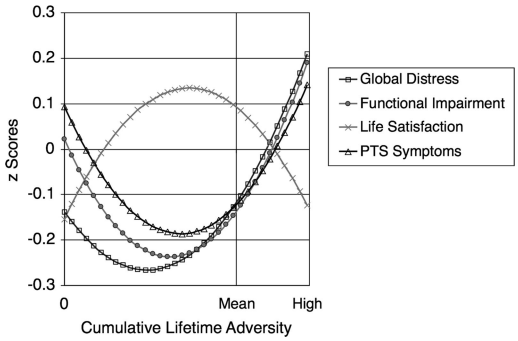

Figure 1. The quadratic relationship between cumulative lifetime adversity and four standardized longitudinal mental health and well-being outcomes. Life satisfaction is positively valenced. On the adversity scale, "0" represents no lifetime adversity and "High" represents *M* + 1 *SD*. Both points are within the sample's range. Observations exist past the "High" point but are not displayed because predicted values are based on progressively fewer observations. PTS = posttraumatic stress.

8	9	10	11	12	13	14	15	16
—								
.04	—							
.04*	−.03	—						
.04*	−.01	.32***	—					
−.03	.12***	−.24***	−.08***	—				
.06**	−.07***	.17***	.26***	−.06**	—			
.05*	−.09***	.26***	.28***	−.18***	.67***	—		
−.07***	.11***	−.10***	−.19***	−.03	−.42***	−.38***	—	
.04	−.04*	.11***	.16***	−.06**	.64***	.42***	−.24***	—
0.15	0.28	3.43	0.15	0.62	0.36	1.40	4.49	1.35
0.36	0.45	3.15	0.35	0.48	0.50	0.68	1.48	0.52
2,058	2,381	2,390	2,390	2,398	2,356	2,354	2,354	2,353

hold size, education, employment status, mental and physical health history, and degree of exposure to the 9/11 attacks), the results presented in Table 2 remained substantively unchanged. For all four outcome variables, the quadratic term ($ps < .002$), simple slope at no adversity ($ps < .017$), and simple slope at high adversity ($ps < .001$) were significant and in the same shape and direction as in analyses without these covariates. Because greater age could increase the opportunity for any given adversity to have occurred at some previous time or may impact the way that later life events are interpreted (cf. Poulin & Silver, 2008), we also tested models with quadratic age terms, thereby paralleling quadratic lifetime adversity; doing so yielded essentially identical results.

Second, when using untransformed variables (as described above), all four quadratic terms remained significant and in the same shape as when using transformed variables ($ps < .001$). The simple slope at no adversity was significant for functional impairment, PTS symptoms, and life satisfaction ($ps < .007$) but did not reach significance for global distress ($p = .16$). The simple slope at high adversity was significant for all outcomes ($ps < .001$). In sum, these supplementary analyses suggest that neither the covariates nor statistical artifact arising from variable transformations can account for the observed pattern of findings for cumulative lifetime adversity. Figure 2 presents the raw values for the outcome variables when treating each level of adversity count as a separate category (i.e., 0, 1, 2, etc.). These raw values reflect the mean of each outcome across Waves 2–4.

Exploring a history of no adversity. To further investigate the differences between respondents with a history of no adverse events versus those with a low adversity count, we divided adversity count into four categories: zero adverse events, 1 event, 2–4 events, and 5+ events. We used these cut points because 1 event is as close as possible to zero, and respondents with a history of 2–4 adverse events tended to report the best outcomes across the four outcome variables (see Figure 2), so this approach allowed us to focus on the most meaningful distinctions between zero and low adversity counts. In a series of separate standard regressions for continuous variables and logistic regressions for dichotomous variables, we used this categorical adversity variable to examine any differences in background characteristics or individual difference variables between groups. Categorical adversity was dummy coded with zero as the reference group. Table 3 presents descriptive statistics and results of analyses comparing the zero adversity group with other categories.

We considered three ways in which background characteristics could potentially explain meaningful differences between respondents in the zero-adversity group versus those with low adversity in particular. First, respondents in the zero group may have been younger than others, allowing them less time to experience adverse life events. However, no significant differences emerged between the zero group and the 1-event and 2–4 groups.

Second, respondents in the zero group may have avoided adversity because they were more socially isolated than others. Having fewer close relationships could lessen the chances of negative events happening to a close other (e.g., injury, illness, death), as well as in the context of one's relationship with a close other (e.g., divorce and domestic abuse). We used marital status as one marker of social isolation. We dichotomized marital status into "never married" versus all others, based on the logic that having never been married is more likely to be a better marker of a history of social isolation than being currently divorced, separated, or widowed (i.e., currently unmarried but having been so in the past). Because marital status does not capture cohabitating couples or most same-sex relationships, we used household size (i.e., living

Table 2
Quadratic Relationship Between Cumulative Lifetime Adversity and Longitudinal Mental Health and Well-Being

Outcome variable and model terms	At no lifetime adversity			At high lifetime adversity ($M + 1$ *SD*)		
	B	95% CI	*p*	*B*	95% CI	*p*
Global distress[a]						
Wave 3	−0.108	−0.148, −0.067	<.001	—	—	—
Wave 4	−0.027	−0.070, 0.016	.215	—	—	—
Lifetime adversity	−0.227	−0.352, −0.103	<.001	0.451	0.355, 0.546	<.001
Quadratic lifetime adversity	0.101	0.070, 0.131	<.001	—	—	—
Functional impairment[b]						
Wave 3	−0.002	−0.047, 0.042	.913	—	—	—
Wave 4	0.015	−0.032, 0.061	.540	—	—	—
Lifetime adversity	−0.358	−0.483, −0.234	<.001	0.476	0.391, 0.561	<.001
Quadratic lifetime adversity	0.124	0.095, 0.153	<.001	—	—	—
Life satisfaction[c]						
Wave 3	−0.004	−0.040, 0.032	.825	—	—	—
Wave 4	−0.015	−0.053, 0.023	.428	—	—	—
Lifetime adversity	0.340	0.211, 0.470	<.001	−0.334	−0.435, −0.233	<.001
Quadratic lifetime adversity	−0.100	−0.132, −0.068	<.001	—	—	—
PTS symptoms[d]						
Wave 3	0.103	0.063, 0.143	<.001	—	—	—
Wave 4	0.158	0.118, 0.198	<.001	—	—	—
Lifetime adversity	−0.352	−0.491, −0.213	<.001	0.396	0.287, 0.504	<.001
Quadratic lifetime adversity	0.111	0.077, 0.146	<.001	—	—	—

Note. CI = confidence interval; PTS = posttraumatic stress. Each outcome variable was tested in a separate analysis. Assessment wave was dummy coded with Wave 2 as the reference group. For each outcome, *quadratic lifetime adversity* refers to the model term for Lifetime Adversity × Lifetime Adversity. Within this quadratic effect, *lifetime adversity* refers to the momentary linear simple slope of the quadratic curve at either no adversity or high adversity. In the no lifetime adversity column, *B* coefficients reflect when zero lifetime adversity was used as the reference point for assessing the simple slope of the quadratic curve; in the high lifetime adversity column, *B* coefficients reflect when $M + 1$ *SD* was used as the reference point. Only information that is not redundant with the no adversity column is presented in the high adversity column. For global distress, functional impairment, and PTS symptoms, negative *B*s for the simple slope at no lifetime adversity indicate that as adversity increases from 0, outcomes *improve* (i.e., symptoms decrease); positive *B*s at high lifetime adversity indicate that as adversity increases from 1 *SD* above the mean, outcomes *worsen* (i.e., symptoms increase). For positively valenced life satisfaction, the direction of these relationships is reversed (i.e., a positive *B* indicates *improving* outcomes).
[a] Model $\chi^2(4, N = 1993) = 137.83$, $p < .001$. [b] Model $\chi^2(4, N = 1992) = 126.91$, $p < .001$. [c] Model $\chi^2(4, N = 1993) = 42.31$, $p < .001$. [d] Model $\chi^2(4, N = 1994) = 111.38$, $p < .001$.

alone vs. not) as an additional marker of social isolation. For both marital status and household size, no significant differences emerged between the zero group and the 1-event and 2–4 groups.

Third, rather than being socially isolated in particular, it is possible that individuals with a history of no adversity are less likely to seek out opportunities in other life domains. Failing to attempt new things could provide shelter from potential negative consequences (i.e., adverse events). We reasoned that current employment status could be one indicator of such a tendency. Specifically, employment represents an opportunity for gain (e.g., income, prestige) but also for loss (e.g., unwelcome changes to daily routine, being fired from the job). If individuals in the zero adversity group were less likely to engage in opportunities in life, they may have been less likely than others to be currently employed. In contrast, analyses revealed no significant differences between the zero, 1, and 2–4 groups.

We also tested for differences in endorsement of Big Five personality dimensions (e.g., McCrae & Costa, 1999). We reasoned that extraversion and agreeableness could be inversely related to tendency for social isolation. However, no significant differences emerged between respondents with a history of no adversity and respondents in the 1-event and 2–4 groups. We further reasoned that openness to experience could be related to seeking life opportunities, but no significant differences emerged between respondents in the zero group and others. We next tested for differences in the remaining two dimensions: conscientiousness and emotional stability (neuroticism when reverse scored). Individuals in the zero group endorsed significantly lower conscientiousness and emotional stability than those in the 2–4 group.

Given that personality dimensions may be particularly likely to be stable over time, we repeated longitudinal analyses, adding the five dimensions as covariates. These analyses revealed that including personality covariates did not substantively affect the relationship between continuous lifetime adversity and mental health and well-being outcomes. As reported above, controlling for background characteristics in longitudinal analyses also had no substantive effect. Thus, findings fail to support the idea that background characteristics and personality dimensions meaningfully contribute to differentiating respondents with a history of no versus low adversity and further fail to support alternative explanations based on age, social isolation, and seeking life opportunities.

Hypothesis 2: Moderation of Recent Adversity by Quadratic Cumulative Lifetime Adversity

Primary analyses. We investigated the impact of exposure to recent adversity on subsequent mental health and well-being outcomes. Specifically, we used the number of adverse events reported at Wave 2 as having been experienced in the previous 6

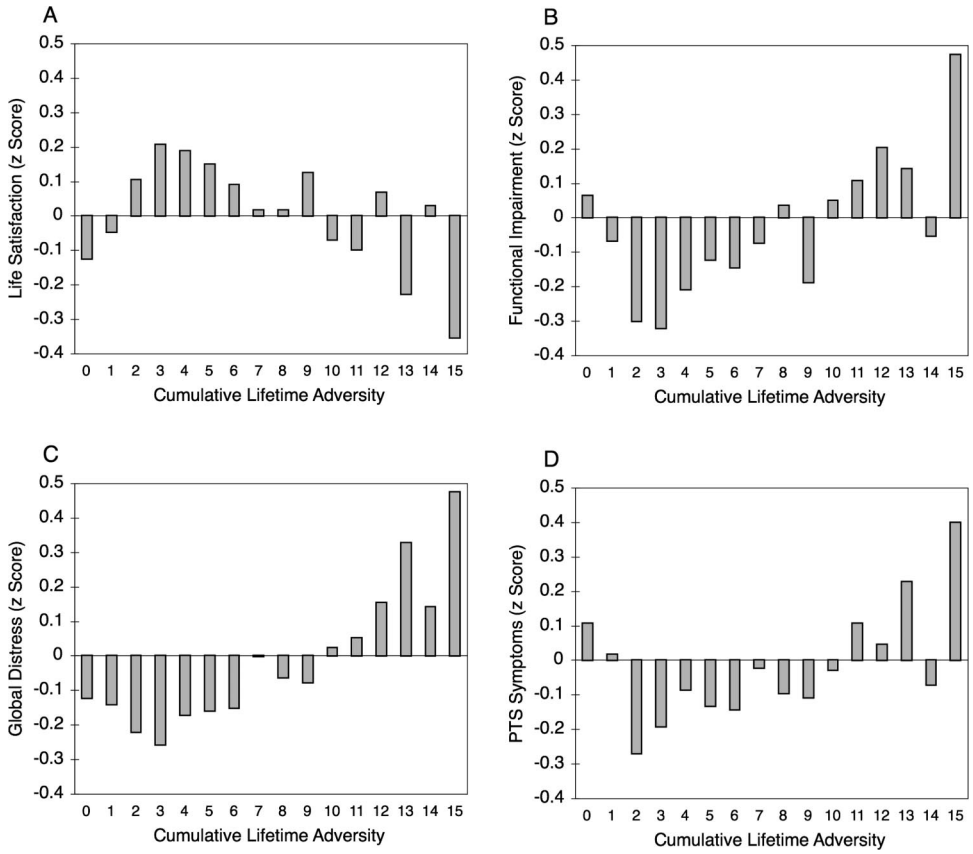

Figure 2. The mean value of four standardized mental health and well-being outcomes at each discrete level of cumulative lifetime adversity count. "15" represents a count of 15 or higher. Mean values reflect the mean of each outcome across Waves 2–4. Life satisfaction is positively valenced. PTS = posttraumatic stress.

months since Wave 1—thus distinct from our measure of lifetime adversity—to predict outcomes in Waves 3 and 4. To focus on changes in mental health and well-being from Wave 1 (i.e., before the recent adversity had occurred), we controlled for Wave 1 values when analyzing each outcome variable.

We first confirmed a linear relationship between greater recent adversity and worse outcomes. Effects of this nature emerged for all four longitudinal outcome variables: Greater recent adversity predicted significantly higher global distress ($B = 0.110$, $p < .001$), functional impairment ($B = 0.087$, $p < .001$), PTS symptoms ($B = 0.090$, $p < .001$), and significantly lower life satisfaction ($B = -0.051$, $p = .003$). Adding a term representing linear cumulative lifetime adversity to these models did not substantively change the results.

We hypothesized that cumulative lifetime adversity would moderate the above relationships between recent adversity and longitudinal outcomes in a quadratic fashion, such that low lifetime adversity would protect against the negative effects of recent adversity, relative to no and high lifetime adversity. We tested models that included the interaction between recent adversity and quadratic lifetime adversity (as well as the appropriate lower order model terms). Consistent with predictions, results revealed significant U-shaped quadratic moderation of the effect of recent adversity on negative outcomes (i.e., a significant interaction term for Recent Adversity × Lifetime Adversity × Lifetime Adversity, predicting global distress, functional impairment, and PTS symptoms) and an inverse U shape for life satisfaction ($ps < .016$). Thus, the magnitude of recent adversity's negative impact on longitudinal outcomes depended on previous lifetime adversity history.

To explore the nature of this moderation effect at no versus high lifetime adversity, we tested terms representing the Lifetime Adversity × Recent Adversity simple interaction. Analogous to the simple slopes tested for Hypothesis 1, this term allowed us to assess the shape of the quadratic moderation effect at the reference points of no versus high adversity. Specifically, for the negative outcome variables, we expected the deleterious impact of recent adversity to significantly decrease in magnitude as lifetime adversity increased from zero (i.e., the slope of recent adversity on the negative outcome should become smaller). This would result in a Lifetime Adversity × Recent Adversity simple interaction term that was negative in sign and significant at zero lifetime adversity. We also expected the deleterious impact of recent adversity to significantly increase in magnitude as lifetime adversity increased to the high value (i.e., the slope of recent adversity should become larger). This would result in a simple interaction term that was positive in sign and significant at high lifetime adversity. For positively valenced life satisfaction, the opposite pattern should

Table 3
Comparing Respondents With Zero Versus Other Categorical Levels of Cumulative Lifetime Adversity on Additional Characteristics

Variable	Number of lifetime adverse events			
	0	1	2–4	5+
Background characteristics (*n*)	194	94	459	1,651
Female gender (%)	44.33	42.55	51.42	52.51*
White ethnicity (%)	60.54	62.64	73.51**	76.26***
Age (*M* years)	44.34	41.45	44.94	51.51***
Income (*M*)	9.56 ($30,000–$34,999)	10.14 ($35,000–$39,999)	10.96*** ($40,000–$44,999)	10.31* ($35,000–$39,999)
Never married (%)	21.86	27.96	18.28	11.92***
Living alone (%)	11.95	11.25	9.23	16.68
College degree or higher (%)	26.06	26.88	33.41	27.47
Number physical health ailments (*M*)	1.92	2.26	2.51*	3.93***
Depression/anxiety diagnosis (%)	8.76	8.51	9.17	17.51**
Currently employed (%)	68.56	76.60	67.97	59.12*
Big Five personality dimensions (*n*)	115	55	294	1,179
Extraversion (*M*)	3.98	3.74	4.00	4.01
Agreeableness (*M*)	4.88	4.81	5.03	5.18**
Conscientiousness (*M*)	5.08	5.21	5.44**	5.53***
Emotional stability (*M*)	4.72	4.63	5.02*	4.94
Openness to experiences (*M*)	4.68	4.64	4.67	4.86

Note. Means are reported for continuous variables and percentages are reported for dichotomous variables. To explore the differences between respondents with a history of no adverse events versus others, the four adversity categories were dummy coded with zero adversity as the reference category. Each of the other three categories was then tested for a significant difference relative to zero adversity. Standard regression was conducted for continuous variables and logistic regression for dichotomous variables. The *n* refers to the maximum *n* in each adversity category when predicting the variables in each set (within each set, actual *n* fluctuated slightly from variable to variable as a function of missing data). The following variables were dichotomous, with the named category coded as 1 and all others coded as 0: female gender, White ethnicity, never married, living alone, college degree or higher, depression/anxiety diagnosis, and currently employed. All other variables were continuous. Household income was reported on a 1–19 scale (ranging from *less than $5,000* to *$175,000 or more*) and was treated as a continuous variable; the label most closely corresponding to the mean value is displayed in parentheses. Big Five personality dimensions were assessed with a 1–7 scale.
* $p < .05$. ** $p < .01$. *** $p < .001$.

occur. The simple interaction terms at reference points of no and high adversity thus provide the best tests of our hypothesis because they reveal the curvilinear pattern of lifetime adversity's influence on the slope between recent adversity and the outcome variables.

At a history of no adversity, the Lifetime Adversity × Recent Adversity simple interaction term was in the predicted direction for all outcomes and was significant ($ps < .05$) for all outcomes except PTS symptoms, which approached significance ($p = .103$). At high adversity, the simple interaction term was significant and in the predicted direction for all outcomes ($ps < .004$). Thus, across the outcome variables as a whole, people with *low* lifetime adversity were *less negatively* affected by recent adversity than people who had experienced either *no* or *high* lifetime adversity (see Figure 3; for statistical details, see Table 4).

Supplementary analyses. As with Hypothesis 1, we conducted two sets of supplementary analyses. First, when we added covariates (in addition to Wave 1 outcome values) to the models, all of the Recent Adversity × Lifetime Adversity × Lifetime Adversity interaction terms remained significant ($ps < .019$) and in the same form as the results presented in Table 4. At a history of no adversity, the Lifetime Adversity × Recent Adversity simple interaction term was in the same direction as in the primary analyses for all outcomes and was significant ($ps < .034$) for all outcomes except PTS symptoms, which approached significance ($p = .099$). At high adversity, the simple interaction term was significant and in the same direction as in the primary analyses for all outcomes ($ps < .019$). We also tested models with quadratic age terms (paralleling quadratic lifetime adversity), which yielded essentially identical results.

Second, when using untransformed variables, the results presented in Table 4 were substantively unchanged: All of the highest order interaction terms were again significant ($ps < .019$), the simple interaction terms at no lifetime adversity were significant

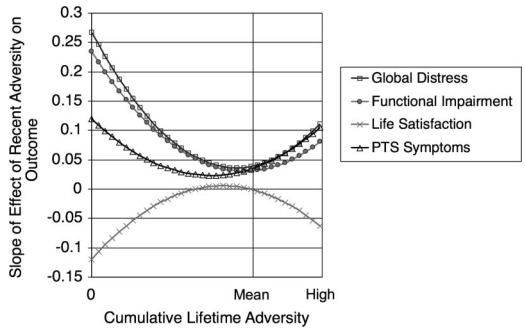

Figure 3. The quadratic relationship between cumulative lifetime adversity and the slope of recent adverse events on four standardized longitudinal mental health and well-being outcomes. Life satisfaction is positively valenced. Plotted values represent *B* coefficients (slopes) for the relationship between recent adversity and outcome at the given level of cumulative lifetime adversity (rather than predicted values of the outcome). A slope of zero indicates that recent adversity did not predict the outcome, whereas slopes with greater absolute values (positive or negative) indicate greater change in the outcome for each unit change in recent adversity. On the adversity scale, "0" represents no lifetime adversity and "High" represents $M + 1$ *SD*. Both points are within the sample's range. Observations exist past the "High" point but are not displayed because predicted values are based on progressively fewer observations. PTS = posttraumatic stress.

Table 4
Cumulative Lifetime Adversity as Quadratic Moderator of the Relationship Between Recent Adversity and Changes in Mental Health and Well-Being

	At no lifetime adversity			At high lifetime adversity (M + 1 SD)		
Outcome variable and model terms	B	95% CI	p	B	95% CI	p
Global distress[a]						
Wave 4	0.076	0.031, 0.122	<.001	—	—	—
Global distress at Wave 1	0.606	0.566, 0.646	<.001	—	—	—
Recent adversity	0.268	0.107, 0.428	.001	0.120	0.075, 0.164	<.001
Lifetime adversity	0.090	−0.038, 0.219	.166	−0.040	−0.140, 0.060	.431
Quadratic lifetime adversity	−0.019	−0.051, 0.012	.226	—	—	—
Recent × Lifetime Adversity	**−0.221**	**−0.343, −0.098**	**<.001**	**0.132**	**0.074, 0.191**	**<.001**
Recent × Quadratic Lifetime Adversity	**0.052**	**0.029, 0.076**	**<.001**	—	—	—
Functional impairment[b]						
Wave 4	0.023	−0.025, 0.071	.346	—	—	—
Functional impairment at Wave 1	0.510	0.470, 0.550	<.001	—	—	—
Recent adversity	0.234	0.041, 0.428	.018	0.086	0.039, 0.134	<.001
Lifetime adversity	−0.009	−0.159, 0.142	.908	0.026	−0.085, 0.137	.646
Quadratic lifetime adversity	0.005	−0.031, 0.041	.778	—	—	—
Recent × Lifetime Adversity	**−0.185**	**−0.329, −0.040**	**.012**	**0.097**	**0.033, 0.160**	**.003**
Recent × Quadratic Lifetime Adversity	**0.042**	**0.014, 0.070**	**.003**	—	—	—
Life satisfaction[c]						
Wave 4	−0.017	−0.058, 0.024	.413	—	—	—
Life satisfaction at Wave 1	0.669	0.635, 0.704	<.001	—	—	—
Recent adversity	−0.120	−0.292, 0.053	.173	−0.069	−0.110, −0.028	<.001
Lifetime adversity	−0.014	−0.157, 0.129	.852	0.044	−0.061, 0.149	.413
Quadratic lifetime adversity	0.009	−0.026, 0.043	.625	—	—	—
Recent × Lifetime Adversity	**0.132**	**0.008, 0.257**	**.037**	**−0.102**	**−0.157, −0.048**	**<.001**
Recent × Quadratic Lifetime Adversity	**−0.035**	**−0.058, −0.011**	**.003**	—	—	—
PTS symptoms[d]						
Wave 4	0.055	0.014, 0.097	.009	—	—	—
PTS symptoms at Wave 1	0.642	0.604, 0.681	<.001	—	—	—
Recent adversity	0.120	−0.057, 0.297	.184	0.111	0.065, 0.157	<.001
Lifetime adversity	−0.058	−0.210, 0.094	.457	0.004	−0.090, 0.098	.933
Quadratic lifetime adversity	0.009	−0.025, 0.043	.594	—	—	—
Recent × Lifetime Adversity	**−0.113**	**−0.248, 0.023**	**.103**	**0.107**	**0.046, 0.169**	**<.001**
Recent × Quadratic Lifetime Adversity	**0.033**	**0.006, 0.059**	**.015**	—	—	—

Note. CI = confidence interval; PTS = posttraumatic stress. Model terms of primary interest are in boldface. Each outcome variable was tested in a separate analysis. Assessment wave was dummy coded with Wave 3 as the reference group. For each outcome, *Recent × Quadratic Lifetime Adversity* refers to the model term for Recent Adversity × Lifetime Adversity × Lifetime Adversity. Within this quadratic interaction, *Recent × Lifetime Adversity* reflects the momentary rate of change in the slope between recent adversity and the outcome variable, at either no or high lifetime adversity. In the no lifetime adversity column, B coefficients reflect when zero lifetime adversity was used as the reference point for assessing the nature of the quadratic influence of lifetime adversity (i.e., does the deleterious effect of recent adversity increase or decrease in magnitude as lifetime adversity increases); in the high lifetime adversity column, B coefficients reflect when M + 1 SD was used as the reference point. Only information that is not redundant with the no adversity column is presented in the high adversity column. For global distress, functional impairment, and PTS symptoms, negative Bs for the simple interaction at no lifetime adversity indicate that as lifetime adversity increases from 0, the negative impact that recent events have on outcomes *decreases*; positive Bs at high lifetime adversity indicate that as lifetime adversity increases from 1 SD above the mean, the negative impact of recent events *increases*. For positively valenced life satisfaction, the direction of these relationships is reversed (i.e., a positive B indicates *decreasing* negative impact).
[a] Model $\chi^2(7, N = 1527) = 1{,}414.20$, $p < .001$. [b] Model $\chi^2(7, N = 1526) = 1{,}011.50$, $p < .001$. [c] Model $\chi^2(7, N = 1526) = 1{,}697.45$, $p < .001$. [d] Model $\chi^2(7, N = 1525) = 1{,}406.38$, $p < .001$.

(ps < .05) except for PTS symptoms (p = .150), and all simple interaction terms at high lifetime adversity were significant (ps < .005). In sum, these supplementary analyses suggest that neither the covariates nor statistical artifact arising from variable transformations can account for the observed pattern of findings.

Discussion

Consistent with prior research on the impact of adversity, linear effects emerged in our results, such that more lifetime adversity was associated with higher global distress, functional impairment, and PTS symptoms, as well as lower life satisfaction. However, our results also yielded quadratic, U-shaped patterns, demonstrating a critical qualification to the seemingly simple relationship between lifetime adversity and outcomes. Supporting Hypothesis 1, our findings revealed that a history of some lifetime adversity—relative to both no and high adversity—predicted lower global distress, lower functional impairment, lower PTS symptoms, and higher life satisfaction. Supporting Hypothesis 2, across these same longitudinal outcome measures, people with a history of some lifetime adversity appeared less negatively affected by recent adverse events than did other individuals. It is also important to note that the observed U-shaped patterns are not completely symmetrical. In many cases, outcomes at the high end of adversity appear more negative than those at zero adversity, and some curves

could be described as more J-shaped than U-shaped (cf. May & Bigelow, 2005; e.g., global distress in Figures 1 and 3 and functional impairment in Figure 3). But across all the outcomes, the curvilinear pattern is clearly established. Moreover, this pattern appears using both modeled data (see Figures 1 and 3) and averaged raw data (see Figure 2). Although these data cannot establish causation, the evidence for both hypotheses is consistent with the proposition that in moderation, experiencing lifetime adversity can contribute to the development of resilience.

Findings for PTS symptoms paralleled findings for other outcomes, despite the fact that PTS symptoms were assessed specifically in reference to the terrorist attacks of September 11, 2001, whereas the other outcomes were not tied to a specific event. This fits with previous research in which PTS symptoms were exacerbated by other negative events (Classen et al., 2002). Given the consistent pattern across all measures—despite their differing foci—our results may best be viewed in terms of implications for general mental health and well-being, which overlaps conceptually with each of the four specific outcomes assessed.

Alternative Explanations

Our reported analyses and study design allow us to address a variety of alternative explanations for our quadratic effects for cumulative lifetime adversity. It is possible that demographic characteristics (gender, ethnicity, age, income, marital status, household size, and education) and other individual difference variables (personality; mental and physical health; employment status; and 9/11-related exposure, which is particularly relevant for PTS symptoms) could explain relationships between lifetime adversity and mental health and well-being outcomes. However, when we repeated analyses with these variables included as covariates, the results were substantively unchanged. We also repeated analyses without using logarithmic or inverse transformations, which, although statistically appropriate for our purposes (Tabachnick & Fidell, 1996), could conceivably introduce a spurious nonlinear relationship between adversity and the outcomes. Again, the results were substantively unchanged. The fact that these supplementary analyses yielded the same pattern of findings as our primary analyses should increase confidence in our interpretation of the results.

Given the critical differences in longitudinal outcomes between individuals with a history of no lifetime adverse events versus those with a history of only a few events, we further explored other ways in which these groups might differ on background characteristics and individual difference variables. Possible alternative explanations for our primary findings differentiating respondents with a history of no versus low lifetime adversity are that individuals with no adversity were younger, more socially isolated, or less likely to seek out opportunities in life. None of these alternatives were supported by our supplementary analyses. Results did reveal that respondents with low adversity endorsed greater emotional stability (i.e., lower neuroticism) and conscientiousness than respondents with no adversity. Dienstbier (1989, 1992) suggested that toughness should be associated with emotional stability, which fits the difference that emerged in our data between individuals with no versus low adversity.

In a longitudinal investigation, it is possible that differential rates of attrition could color results if the attrition is related to key variables in the analysis. Respondent attrition was predicted by age and linear lifetime adversity. It is important to note, however, that quadratic lifetime adversity, outcome measures reported at Wave 1 (before any dropout), and interactions between Wave 1 outcomes and linear and quadratic lifetime adversity all failed to predict attrition significantly. Hence, there was no evidence that the pattern of attrition overlapped with the pattern of substantive findings, or that respondents with relatively high or low levels of mental health and well-being were disproportionately likely to drop out of the study. This leaves little reason to believe that differential attrition can account for our results.

Because respondents reported cumulative adversity retrospectively, it is possible that mental health and well-being outcomes experienced at Wave 1 could have biased recall of prior lifetime adversity, or that a general reporting bias could have led to an association between high adversity and poor outcomes. However, several aspects of our design and analyses minimize the likelihood that any such bias can explain our findings. First, data collection was longitudinal rather than cross-sectional, decreasing the probability of confounding predictors and outcomes. Second, analyses testing quadratic moderation of recent events (Hypothesis 2) controlled for outcomes experienced at Wave 1, before the recent events had occurred. This would have accounted for a spurious association between lifetime adversity recall and stable differences in reporting of mental health and well-being outcomes. Even if respondents who consistently reported high levels of negative outcomes across assessment waves were also biased to recall more lifetime adversity, including Wave 1 outcome values as covariates should have yielded effects above and beyond such bias. Third, the observed quadratic relationships—unlike linear relationships—are difficult to attribute to recall or reporting biases (e.g., trait negative affectivity; Watson & Pennebaker, 1989). Although these biases potentially explain why reports of high adversity and high levels of negative outcomes might co-occur, a relationship in the opposite direction also emerged in our data. Inconsistent with a recall or reporting bias, respondents who reported no previous adversity reported worse outcomes than respondents who reported some adversity. In sum, given these elements of our design and analyses, it seems difficult to attribute our findings to biases in recall or reporting.

Assessing Adversity

Our adversity measure represented the number of events experienced rather than detailed characteristics of events, so meaningful variability in adversity may not have been captured. However, simple counts avoid potential ambiguities. For example, isolating effects of single adversities is difficult, given that events are not experienced in a vacuum but, rather, in the context of individuals' adversity history (Dong et al., 2004; Green et al., 2010). Attempting to rate event severity objectively can be problematic because not everyone experiences adversities identically (Silver & Wortman, 1980). For example, what may seem discrete or limited to observers may become chronic or more severe if individuals ruminate about it. Relying on individuals to judge severity for themselves potentially confounds severity with individuals' response to adversity, which is the outcome of interest (Kessler, 1997). For example, rating an event as severe in magnitude could reflect "objective" qualities of disruptiveness and severity of the event itself, the rater's lack of resilience in responding to the event, or a combination of the two.

Nonetheless, more detailed measures of cumulative adversity could provide other important information. We did not consider the specific type of prior adverse event and the impact of different types of experiences on outcomes over time. It is possible that some aversive life events tend to be more "strengthening" than others (cf. Silver & Wortman, 1980). In contrast, some life experiences, such as chronic exposure to social or environmental stressors, may be particularly taxing. The repeated experience of a particular type of traumatic event (e.g., childhood sexual abuse) may have different long-term implications than repeated exposure to illness or loss, perhaps because of the larger questions of unfairness and injustice such events may trigger or the increased amount of self-blame they may engender (Silver & Wortman, 1980). For example, evidence supports that prior experience with natural disasters may mitigate negative outcomes when an individual is subsequently exposed to the same type of natural disaster, such as floods (Norris & Murrell, 1988) or earthquakes (Knight, Gatz, Heller, & Bengtson, 2000). But prior occurrences of other types of adversity do not necessarily lead to this pattern. Luhmann and Eid (2009) found that although a second divorce predicted less negative effects on life satisfaction than a first divorce, repeated unemployment predicted progressively lower life satisfaction.

Other aspects of adversity may be important for developing toughness and mastery. For example, Hamburg and Adams (1967) suggested that the success of one's prior coping efforts should be a key determinant in responses to future adversity. Given that manageable stressors should be more likely than overwhelming ones to result in successful coping, this notion is consistent with successful coping in particular contributing to mastery and control (Chorpita & Barlow, 1998; Mineka & Zinbarg, 2006) and toughness (Dienstbier, 1989, 1992). Dienstbier's (1989, 1992) theory further emphasizes the relevance of the timing between adverse events, in that adequate opportunity for recovery between stressors should promote toughness development. Although it is challenging to reliably and precisely define the end of a single adverse event and its psychological effects (see the preceding discussion), doing so could provide meaningful insight when assessing adversity in future work, as could incorporating measures of coping success.

To test differences between a history of no cumulative lifetime adversity and low adversity effectively, it was particularly important to assess a wide range of events and facilitate maximal reporting of them. Otherwise, respondents with no and low adversity would have been more likely to yield identical totals, making it impossible to differentiate between them. Self-report assessments of life events are not without criticism (Dohrenwend, 2006), but sensitive topics are more likely to be acknowledged in self-report assessments than in interviews. By decreasing social desirability concerns, Web-based data collection improves accuracy of reports over less anonymous methods (Schlenger & Silver, 2006). We assessed more types of adversity than is typical in research investigating adversity history, and we allowed respondents to endorse multiple instances of each type, which should have further helped to differentiate no versus low adversity. This likely contributed to revealing quadratic relationships between adversity history and mental health and well-being outcomes, as opposed to only the typical linear relationships identified in both prior research and our own data. When no and low adversity are not sufficiently differentiated, it is tantamount to collapsing across individuals with no and low adversity. This should be more likely to obscure the protective influence of having experienced some prior adversity, as well as enhance the linear relationship between adversity and outcomes.

Furthermore, some types of adverse events may be particularly likely to cluster together (e.g., Green et al., 2010). If only events in the cluster are assessed, individuals will disproportionately endorse either most or none of the events. This should force a comparison similar to the one described above, between histories of high adversity versus a combination of no and low adversity. In contrast, assessing a wide variety of events that better represents the full range to which people may be exposed (i.e., including those outside the cluster) should maximize the opportunity to reveal individuals who fall between either extreme of cluster endorsement. This should better differentiate no versus low adversity history, thereby facilitating discovery of evidence for resilience.

Despite its relatively extensive nature, our adversity measure did not necessarily include all possible or relevant events. Events that do not meet standard definitions of trauma can still make important contributions to adversity counts (Lloyd & Turner, 2003). Similarly, minor challenges faced in the vicissitudes of life may also play a role in building toughness and mastery (Chorpita & Barlow, 1998; Dienstbier, 1989, 1992; Mineka & Zinbarg, 2006). In part for these reasons, it is likely impossible to identify a precise "ideal" number of prior adverse events that are protective of future mental health difficulties (although Figure 2 suggests that experiencing on average around three events may be a turning point). Our purpose was not to identify such a number but, instead, to demonstrate the theoretically meaningful distinction between "some" versus "none." Future research can further investigate the range of life experiences that may be initially undesirable and disruptive but nonetheless facilitate subsequent mental health.

Fostering Resilience and Mental Health and Well-Being

Our results suggest that previous research does not paint a complete picture of adversity's role in building resilience and, more broadly, mental health and well-being. Resilience involves having psychological and social resources that help people tolerate adversity (Rutter, 2007), but coping with adversity may itself promote development of subsequent resilience (see, e.g., Aldwin, Sutton, & Lachman, 1996; Carver, 1998; Egeland, Carlson, & Sroufe, 1993). Although our data are correlational and therefore cannot establish causality, it is possible to speculate how causal mechanisms could function. Experiencing low but nonzero levels of adversity could teach effective coping skills, help engage social support networks, create a sense of mastery over past adversity, foster beliefs in the ability to cope successfully in the future, and generate psychophysiological toughness (e.g., Chorpita & Barlow, 1998; Dienstbier, 1989, 1992; Mineka & Zinbarg, 2006; Silver & Wortman, 1980). All of these qualities should contribute to resilience in the face of subsequent major adversity. Such qualities should also make subsequent minor daily hassles seem more manageable rather than overwhelming, leading to benefits for overall mental health and well-being. For example, regular workplace demands formerly experienced as stressful could be reappraised as trivial. However, higher levels of adversity could negate these benefits by overtaxing coping skills and support networks,

creating feelings of hopelessness and loss of control, and disrupting the development of toughness. Resilience to subsequent major adversity should be inhibited, and minor hassles should be more likely to seem overwhelming, exerting a toll on mental health and well-being.

We did not directly assess these and other possible mechanisms and mediators of our observed effects. For example, self-enhancement (Bonanno, Field, Kovacevic, & Kaltman, 2002), positive emotions (Folkman & Moskowitz, 2000; Fredrickson, 2001), and directing attention away from negative emotions (Coifman, Bonanno, Ray, & Gross, 2007) have been associated with resilience in the face of adversity. It seems reasonable that such predictors of resilience could also be associated with mastery and toughness, and—in turn—low but nonzero levels of lifetime adversity. Assessing behavioral and physiological mediators could provide further insight into the underlying mechanisms. Indeed, Dienstbier's (1989) review explicitly incorporates a psychophysiological component to the toughness construct. There seem to be many avenues for future empirical work to expand this area of research.

We believe that the current investigation has important theoretical implications. The concept of posttraumatic or adversarial growth (e.g., Linley & Joseph, 2004; Tedeschi & Calhoun, 2004) also addresses the potential positive consequences of major life adversity (see also Updegraff & Taylor, 2000). Adversarial growth refers to when the process of coping with adversity leads to higher levels of psychological functioning and well-being than previously experienced. Affleck and Tennen (1996) concluded that after experiencing a major medical problem (e.g., HIV infection; Updegraff, Taylor, Kemeny, & Wyatt, 2002), people commonly report benefits or gains, such as improved social relationships, new and valued life priorities, and developing greater patience and courage. Tedeschi and Calhoun (2004) suggested that only adversity of large enough magnitude to be considered "seismic" should substantially disrupt individuals' existing beliefs about the world, which allows such beliefs to be reconstructed in a way that yields personal growth. However, in keeping with Dienstbier's (1989, 1992) perspective, Aldwin and Levenson (2004) maintained that relatively minor stressors also promote growth. Conceptually, then, adversarial growth seems to overlap with the development of mastery and toughness, and specifically suggests that adversity contributes to such development. For example, after a serious illness, other adversities and stressors may seem less critically important and overwhelming by comparison.

Although empirical evidence supports the existence of adversarial growth, Bonanno (2005) argued that this evidence does not establish whether reported growth is real or simply perceived, given that these findings are limited to retrospective, postadversity reports in mostly cross-sectional designs, without preadversity assessments. Our investigation was not designed to test adversarial growth in particular, but the benefits of experiencing some adversity may represent a form of adversarial growth (Linley & Joseph, 2004), consistent with a lesser, rather than greater, challenge to one's beliefs (see Aldwin & Levenson, 2004; Tedeschi & Calhoun, 2004). Alternatively, prior adversity may predict adversarial growth after a specific subsequent major event, such that dramatic growth should be unlikely to occur among already resilient people (Bonanno, 2005).

The idea of adversarial growth may also shed light on the experience of people with a history of no adversity, who essentially have not had the opportunity to appreciate benefits in adversity. For these individuals, distress they experience may be difficult to explain, justify, or find meaning in, given the absence of negative life events. This lack of compelling reason for their distress may prove even more distressing, relative to people who have experienced some adversity. Most directly relevant for this possibility are the results from Hypothesis 2, which revealed that respondents with no prior adversity were more negatively affected by recent adversity than were individuals with low lifetime adversity. At least in the relative short term (i.e., within the 2 years we followed our sample), the experience of new adversity served no obvious benefit for people with a history of no prior adversity. However, it may be the case that such benefits take longer to emerge, such as after the acute effects of recent adversity have faded.

Adversity history may be relevant for other theories focusing on coping resources, such as the reserve capacity model (Gallo, Bogart, Vranceanu, & Matthews, 2005; Gallo, Espinosa de los Monteros, & Shivpuri, 2009), which uses psychosocial factors to explain the relationship between lower socioeconomic status and worse physical health outcomes. Low but nonzero lifetime adversity may promote the constellation of resources referred to as reserve capacity, which in turn predicts better physical health. Given that coping with stress permeates widely through social psychological phenomena—ranging from being the target of prejudice and discrimination to rejection in close relationships and threats to self-esteem—the beneficial effects of prior adversity have the potential to generate new research across many areas of study.

Our results should not be construed to endorse intentional trauma exposure or to deny that adversity can have negative consequences for mental health and well-being, especially in the short term. Instead, they highlight that people are not doomed to be damaged by adversity. Beyond recovering to past levels of functioning in the aftermath of adversity, we found evidence consistent with people actually benefiting from the experience of some adversity. Ultimately, a richer understanding of how adversity contributes to positive mental health and well-being and resilience may suggest ways to promote them. To modify an adage, in moderation, whatever does not kill us may indeed make us stronger.

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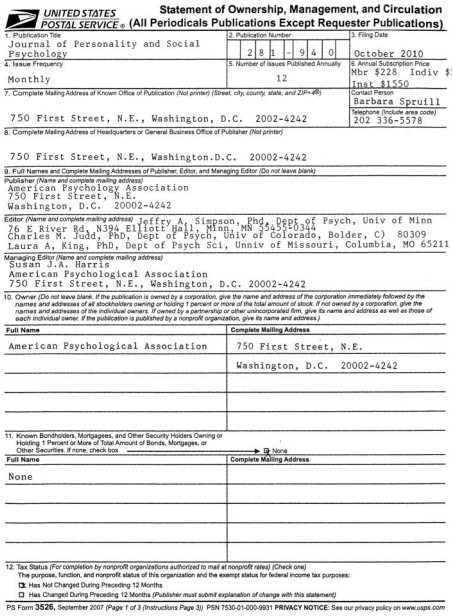

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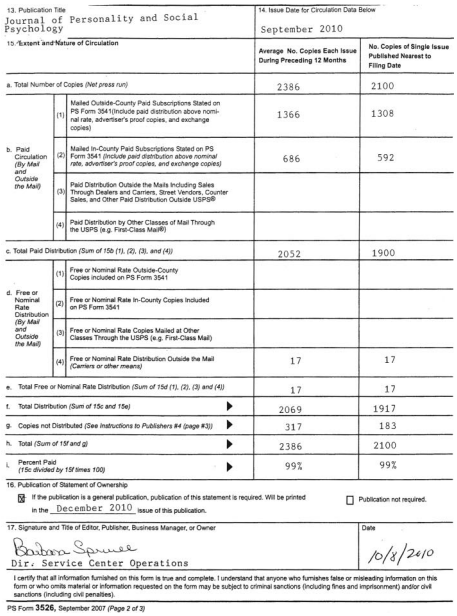

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