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Resilient Individuals Use Positive Emotions to Bounce Back From Negative Emotional Experiences

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Theory indicates that resilient individuals "bounce back" from stressful experiences quickly and effectively. Few studies, however, have provided empirical evidence for this theory. The broaden-and-build theory of positive emotions (B. L. Fredrickson, 1998, 2001) is used as a framework for understanding psychological resilience. The authors used a multimethod approach in 3 studies to predict that resilient people use positive emotions to rebound from, and find positive meaning in, stressful encounters. Mediational analyses revealed that the experience of positive emotions contributed, in part, to participants' abilities to achieve efficient emotion regulation, demonstrated by accelerated cardiovascular recovery from negative emotional arousal (Studies 1 and 2) and by finding positive meaning in negative circumstances (Study 3). Implications for research on resilience and positive emotions are discussed.

There are individuals who seem to "bounce back" from negative events quite effectively, whereas others are caught in a rut, seemingly unable to get out of their negative streaks. Being able to move on despite negative stressors does not demonstrate luck on the part of those successful individuals but demonstrates a concept known as resilience. Psychological resilience refers to effective coping and adaptation although faced with loss, hardship, or adversity. Resilience to certain events has been likened to elasticity in metals (Lazarus, 1993). For example, cast iron is hard, brittle, and breaks easily (not resilient), whereas wrought iron is soft, malleable, and bends without breaking (resilient). This metaphor can be carried over to psychological resilience, which entails a similar resistance to the psychological strain associated with negative experiences. This investigation examines psychological resilience, focusing on its subjective, cognitive, and physiological qualities.

The Construct of Resilience

Psychological resilience has been characterized by the ability to bounce back from negative emotional experiences and by flexible adaptation to the changing demands of stressful experiences (J. H. Block & Block, 1980; J. Block & Kremen, 1996; Lazarus, 1993). This definition captures a psychological frame of mind that is associated with a variety of behavioral and psychological outcomes. A convergence across several research methodologies indicates that resilient individuals have optimistic, zestful, and energetic approaches to life, are curious and open to new experiences, and are characterized by high positive emotionality (J. Block & Kremen, 1996; Klohnen, 1996). Additional evidence suggests that high-resilient people proactively cultivate their positive emotionality by strategically eliciting positive emotions through the use of humor (Werner & Smith, 1992), relaxation techniques (Demos, 1989; Wolin & Wolin, 1993), and optimistic thinking (Kumpfer, 1999). Positive emotionality, then, emerges as an important element of psychological resilience. Surprisingly, however, few studies have yet to explore specifically why positive emotions are useful: Are positive emotions merely by-products of resilient modes of thinking, or do they serve some function in the ability of resilient individuals to cope effectively in the face of stress?

Positive Emotions and Negative Emotion Regulation

Coping researchers have begun to investigate the utility of positive emotions in stressful contexts. A review of recent evidence indicates that positive emotions help buffer against stress (Folkman & Moskowitz, 2000). For instance, positive coping strategies, such as positive reappraisal, problem-focused coping, and infusing ordinary events with positive meaning are related to the occurrence and maintenance of positive affect (Folkman & Moskowitz, 2000) and predict increases in psychological well-being and health (Affleck & Tennen, 1996). These findings suggest that positive emotions are valuable tools for establishing enhanced outcomes in well-being. Even so, an important question emerges: Why do positive emotions amidst stress have adaptive significance (Folkman & Moskowitz, 2000)?

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The Broaden-and-Build Theory of Positive Emotions

A useful framework with which to understand why and how positive emotions may be useful in the coping process is the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001). This theory corroborates with research demonstrating the cognitive and social benefits associated with positive emotions (see Isen, 1999). According to the broaden-and-build theory, positive and negative emotions have distinct and complementary adaptive functions and cognitive and physiological effects. This theory posits that negative emotions narrow one's momentary thought–action repertoire by preparing one to behave in a specific way (e.g., attack when angry, escape when afraid). In contrast, various discrete positive emotions (e.g., joy, contentment, interest) broaden one's thought–action repertoire, expanding the range of cognitions and behaviors that come to mind. These broadened mindsets, in turn, build an individual's physical, intellectual, and social resources (for reviews of the broaden-and-build theory, see Fredrickson, 1998, 2001). This perspective on positive emotions might help explain why those who experience positive emotions in the midst of stress are able to benefit from their broadened mindsets and successfully regulate their negative emotional experiences.

The implications of the broaden-and-build theory for negative emotion regulation can be demonstrated in research that explores the physiological consequences of positive emotions. In line with the broaden-and-build theory, the narrowing of thought–action repertoires associated with negative emotions is accompanied by cardiovascular reactivity that prepares the body for specific action. In contrast, positive emotions broaden the thought–action repertoire, which should "undo" the lingering cardiovascular aftereffects of negative emotions. Thus, in line with the broaden-and-build theory, positive emotions appear to have a unique ability to physiologically down-regulate lingering negative emotions (for details of the undoing effect, see Fredrickson & Levenson, 1998; Fredrickson, Mancuso, Branigan, & Tugade, 2000).

Emotion Knowledge: Using Positive Emotions to Cope

Might certain individuals have a greater tendency to draw on positive emotions in times of stress? Accumulating evidence suggests that there may be individual differences in people's abilities to cognitively represent their emotions and exert effective control over their emotional lives, allowing some to more effectively manage their emotions during stressful situations (Feldman Barrett & Gross, 2001; Salovey, Hsee, & Mayer, 1993). Indeed, evidence from a recent experience-sampling study found that greater emotion knowledge (especially the ability to discriminate among negative emotions) was associated with larger repertoires of emotion regulation strategies, indicating that the ability to use emotion knowledge can have beneficial effects on emotion regulation (Feldman Barrett, Gross, Christensen, & Benvenuto, 2001). It is plausible that the knowledge and effective use of positive emotions might provide advantages in the coping process as well.

Along these lines, Salovey and colleagues (Salovey & Mayer, 1989–1990) described emotional intelligence as the ability to monitor one's own and others' feelings and emotions, to discriminate among them, and to use this information to guide one's thinking and action. It is important to note that there are individual differences in the ability to process this information and use it to one's benefit when coping with negative circumstances. It is possible, then, that emotional intelligence plays a significant role in the lives of resilient people. Specifically, what might distinguish low and high-resilient people is their capacity to learn from life's setbacks and use this knowledge to cope more effectively (Salovey, Bedell, Detweiler, & Mayer, 1999). Given the evidence showing that positive emotions indeed produce beneficial outcomes in the coping process (e.g., Folkman & Moskowitz, 2000; Fredrickson, 2000) and that certain individuals are more adept at using emotion knowledge to cope in times of stress (e.g., Feldman Barrett & Gross, 2001; Salovey et al., 1993), it is possible that certain individuals have a greater tendency to draw on positive emotions in times of stress, intuitively using positive emotions to their advantage. Psychologically resilient people—who are described as emotionally intelligent (Salovey et al., 1999)—appear to be likely candidates for this type of intuition (Tugade & Fredrickson, 2002).

Overview of Research

This research employs a multimethod approach to examine the relations between positive emotions and psychological resilience. Studies 1 and 2 used psychophysiological data to explore the bodily components of resilience (Study 1) and to understand the role that positive appraisals and positive emotions have in regulating physiological arousal associated with stress (Study 2). Study 3 examined naturally occurring stressors to further explore how positive emotions may be beneficial in the coping process, by examining their relations to finding positive meaning in negative events. Throughout this investigation, we predict that positive emotions help resilient individuals achieve beneficial consequences in emotion regulation.

Study 1

Study 1 used psychophysiological methods to explore the emotion regulatory processes associated with psychological resilience. Although no studies to our knowledge directly examine the relations between psychological resilience and its physiological qualities, neighboring concepts such as hardiness (Wiebe, 1991), optimism (Carver & Scheier, 1998), and dispositional humor (Dillon, Minchoff, & Baker, 1985–1986) indicate that coping styles with properties related to psychological resilience have demonstrable relations to physical well-being. Although much of the existing literature has focused on *magnitudes* of reactivity to stress, what is missing from the existing literature on psychological resilience and its neighboring concepts is an examination of *durations* of reactivity to stress. Research has suggested that extended periods of sympathetic arousal may be related to negative health outcomes (Fredrickson, Maynard, et al., 2000; Kaplan, Manuck, Williams, & Strawn, 1993). As such, it may be fruitful for emotion regulation and resilience research to examine durations of physiological reactivity in response to stress in addition to the magnitude of physiological activation.

There are individual differences in cardiovascular recovery from negative emotional arousal. For instance, compared with hostile individuals, nonhostile individuals evidence shorter durations of cardiovascular reactivity in response to an anger-inducing stressor,

independent of differences in magnitudes of response stress (Fredrickson, Maynard, et al., 2000). Thus, durations of cardiovascular reactivity are sensitive to psychological individual differences and perhaps related to properties of emotion regulation. These findings point to the promise of measures of cardiovascular duration for research on resilience. If resilient individuals indeed have the psychological capacity to rebound despite stress (e.g., J. H. Block & Block, 1980; Carver, 1998; Lazarus, 1993), then it is reasonable to predict that this ability to bounce back would be reflected physiologically as well. Thus, the main prediction of this study was that high-resilient individuals would evidence faster cardiovascular recovery from a stressor, relative to low-resilient participants.

In addition, Study 1 aimed to demonstrate that faster cardiovascular recovery from negative emotional arousal would be attributable in part to experiences of positive emotion. This prediction is based on the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001). Because resilient people are characterized by high positive emotionality (e.g., J. Block & Kremen, 1996; Klohnen, 1996) as well as proactive efforts to cultivate positive emotions (J. H. Block & Block, 1980; Wolin & Wolin, 1993), we hypothesized that their experiences of positive emotion assist in their emotion regulatory processes.

Finally, given the critical role that appraisals have in the emotion generation and coping processes (Lazarus & Folkman, 1984) and that resilient individuals are said to more effectively regulate their emotions (e.g., Lazarus, 1993; Masten, 2001; Rutter, 1987), Study 1 predicts that high-resilient participants would appraise a stressful task as less threatening, compared with low-resilient participants. Taken together, we hypothesized that, compared with low-resilient individuals, high-resilient individuals would report greater positive emotionality (Hypothesis 1), appraise the stressful task as less threatening (Hypothesis 2), and would experience faster cardiovascular recovery following the task (Hypothesis 3). Finally, we predicted that differences in time to achieve cardiovascular recovery would be mediated by experiences of positive emotions (Hypothesis 4).

Method

Participants

Participants were 57 (74% female) undergraduates at the University of Michigan, aged 17 to 40 ($M = 19.26$, $SD = 2.96$). They received course credit for their participation. Thirty-five participants were Caucasian, 16 were ethnic minorities (7 African Americans, 8 Asians, 1 Hispanic), and 6 were of other or unspecified ethnic background.[1]

Negative Emotion Induction

The experimenter asked participants to mentally prepare a speech on a to-be-determined topic. After the preparation period, participants were told to look into the video camera and speak clearly. They were also told that the videotaped speech would be shown to peers in another study for evaluation. In actuality, no participants delivered their speech.

Measures

Psychological resilience. The Ego-Resiliency Scale (J. Block & Kremen, 1996) was administered to assess trait psychological resilience, which is the capacity to modify responses to changing situational demands, especially frustrating or stressful encounters. This scale consists of 14 items, each responded to on a 4-point Likert scale, ranging from 1 (*does not apply at all*) to 4 (*applies very strongly*). Sample items include "I quickly get over and recover from being startled," and "I enjoy dealing with new and unusual situations." For this sample, the alpha reliability was .71. J. Block and Kremen's (1996) reported alpha was .76.

Positive and negative ambient mood. Positive and negative mood were assessed with a modified version of the Positive and Negative Affectivity Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Participants were asked to rate the extent to which they felt a number of emotions "*Right now*, that is, at the present moment." Ratings were made on a 5-point Likert scale, ranging from 1 (*very slightly or not at all*) to 5 (*extremely*).

The original PANAS consists of 10 items in the Positive Activation (PA) subscale (active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, strong) and 10 items in the Negative Activation (NA) subscale (afraid, ashamed, distressed, guilty, hostile, irritable, jittery, nervous, scared, upset). In addition to these terms, we included 18 other affective terms (amused, angry, anxious, blue, calm, content, curious, depressed, disappointed, discouraged, disgusted, happy, relaxed, relieved, sad, satisfied, surprised, tired). We subjected all of the affect terms (original and added items) to a principal-components factor analysis. Two dominant factors emerged, together accounting for 42% of the common variance. In factor analyses using only the items from the original PANAS (Watson et al., 1988), two factors account for 30% of the common variance. Positive and negative mood scales were then calculated by summing original and added items to yield separate subscales, each with 19 items: positive mood scale ($\alpha = .90$), negative mood scale ($\alpha = .84$).

Emotion report. Subjective experiences during the experimental session were assessed using emotion reports. Participants rated the amount felt of the following 14 emotions: afraid, amused, angry, anxious, content, disappointed, disgusted, eager, excited, frustrated, happy, interested, surprised, and sad. Ratings were made on 9-point Likert scales, ranging from 0 (*none*) to 8 (*a great deal*).

Cognitive appraisal. Cognitive appraisal of the speech preparation task was assessed by asking, "How threatening do you think it will be to complete the speech task?" (adapted from Tomaka, Blascovich, Kelsey, & Leitten, 1993) and "How psyched-up are you to complete the upcoming speech task?" Ratings were made on a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*extremely*).[2]

Cardiovascular. Continuous recordings were made of six cardiovascular measures at a sampling rate of 1,000 Hz. From these recordings, second-by-second averages were computed.

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[1] The ethnic diversity of the samples reported in this investigation reflect the Introductory Psychology Subject Pool at the University of Michigan and thus include only small subsamples of ethnic minorities. As such, in each of the studies, ethnic differences are explored by comparing Caucasian students to non-Caucasian students. In Studies 1 and 2, there were no ethnic differences; therefore, all reported analyses for those studies were conducted by collapsing across ethnic groups.

[2] Participants were also asked, "How challenging do you think it will be to complete the upcoming task?" Findings indicated that there were no significant differences between participants' reports of challenge and threat based on these question stems. These findings are consistent with work by Kubzansky (1996) who found that the meaning of the word *challenge* may have changed over time to now have a more negative connotation. On the basis of her recommendation, the term *psyched-up* (as well as *challenge*) was examined as the positive counterpart to threat. In this way, we acknowledge the current usage of the term as well as attempting to remain consistent with other researchers who have used *challenge* and *threat* in their research (e.g., Lazarus & Folkman, 1984; Tomaka et al., 1993, 1997).

Heart rate (HR):	Disposable snap electrodes were placed in a bipolar configuration on opposite sides of the chest to measure the participant's echocardiogram (ECG).
Finger pulse amplitude (FPA):	A photoplethysmograph was attached to the distal phalange of the third finger of the nondominant hand and the trough-to-peak amplitude of each finger pulse was measured to assess the amount of blood in the tip of the finger and to provide a measure of peripheral vasoconstriction.
Pulse transmission times to the finger (PTF):	The interval was timed between the R spike of the ECG and the upstroke of the pulse wave at the finger.
Pulse transmission time to the ear (PTE):	A photoplethysmograph was attached to the right ear and the interval was timed between the R spike of the ECG and the upstroke of the pulse wave at the ear. The two pulse transmission times index the contractile force of the heart along with distensibility of the blood vessels (Newlin & Levenson, 1979).
Diastolic blood pressure (DBP) and systolic blood pressure (SBP):	A self-regulating finger cuff was attached to the middle phalange of the second finger of the participant's nondominant hand; a sling was used to immobilize the participant's arm at heart level. An Ohmeda Finapres Blood Pressure Monitor (Model 2300; Ohmeda, Inc., Helsinki, Finland) was used to collect beat-by-beat measures of both DBP and SBP.

This set of measures was selected to allow for continuous, noninvasive assessment of cardiovascular activity. Four cardiovascular measures track changes mediated by the sympathetic nervous system (FPA, PTF, PTE, and SBP). HR, and to a lesser extent DBP, are controlled by both sympathetic and parasympathetic branches of the autonomic nervous systems.

Procedure

Participants were tested singly by a female experimenter. On arrival, participants were seated in a comfortable chair facing a 25-inch color video monitor in a small, well-lit room. They were told that the study was about emotions and that their bodily reactions would be monitored by physiological sensors. The participants then signed a consent form and completed the modified PANAS. Physiological sensors were then attached as described above.

After a 5-min adaptation period, participants were told that they would be given precisely 60 s to prepare a 3-min speech on a to-be-determined topic. In actuality, participants did not have to deliver their prepared speech. After receiving instructions, participants rated their cognitive appraisal of the upcoming speech task.

Following another adaptation period (3 min), a 60-s resting baseline period provided pretask levels of cardiovascular activity. Next, videotaped screen instructions informed the participants to begin preparing a speech on "Why you are a good friend." After the speech preparation task, a video screen was shown, indicating that the participant would not have to deliver a speech after all. This screen was in turn followed by a 3-min posttask period during which the video monitor was blank. Afterward, participants completed an emotion report to describe how they felt while preparing their speech. They then rated their cognitive appraisal of the speech preparation task, and finally, they completed the Ego-Resiliency Scale.

Results

Psychological Resilience

Psychological resilience was indexed by the J. Block and Kremen (1996) Ego-Resiliency Scale. Across participants, mean resilience was 42 ($SD = 6.41$), ranging from 28 to 54.

Manipulation Checks on Negative Emotion Induction

To explore whether the speech preparation task induced negative emotional arousal as intended, we examined emotion reports and cardiovascular reactivity in response to the task.

Self-report data. Analyses of the emotion reports completed for the speech preparation task confirmed that this task elicited higher levels of anxiety than any other emotion ($M = 4.53$, $SD = 2.35$). Reports of anxiety did not differ by sex and they were not related to trait psychological resilience. Next, because participants believed that they were to deliver their prepared speeches, we examined subjective experiences of the emotion surprise "When you found out you didn't have to give your speech after all." Reports of surprise ($M = 2.80$, $SD = 2.05$) were not related to psychological resilience or sex.

Cardiovascular data. For each participant, and for each of the six indices of cardiovascular reactivity (HR, FPA, PTF, PTE, DBP and SBP), we determined mean levels during the 60-s pretask baseline and over the 60-s speech preparation task. These means, averaged across participants, are shown in Table 1. Within-subject *t* tests confirmed that mean reactivity during the speech task was significantly greater than baseline levels for all six variables (see Table 1). These changes reflect task-induced cardiovascular arousal, which includes sympathetic activation (e.g., heart rate acceleration, increased blood pressure, and peripheral vasoconstriction). Cardiovascular reactivity during baseline and during the speech-preparation task did not differ by sex or trait resilience.

Taken together, self-report and physiological data indicate that the speech preparation task induced anxiety and cardiovascular reactivity that was significantly different from baseline levels, and equally so for participants with low and high levels of psychological resilience.

Hypothesis 1: Resilience and Positive Emotionality

To test the hypothesis that high-resilient individuals would show more positive emotionality, we examined self-reported positive (and negative) ambient mood, as well as subjective reports in response to the speech preparation task.

Table 1
Study 1: Cardiovascular Reactivity During Pretask Baseline and Speech Preparation Task

	Pretask baseline		Speech preparation task	
Variable	*M*	*SD*	*M*	*SD*
HR	79.37	14.18	94.52	15.92***
FPA	1.98	0.42	1.62	0.56***
PTF	0.240	0.017	0.236	0.019**
PTE	0.19	0.02	0.18	0.02***
DBP	57.56	14.32	61.74	13.65*
SBP	134.30	23.76	151.61	25.63***

Note. Asterisks indicate changes significantly different from resting baseline measures by within-subject *t* tests ($df = 55$). HR = heart rate in beats per minute; FPA = finger pulse amplitude in millivolts; PTF = pulse transmission time to the finger in milliseconds; PTE = pulse transmission time to the ear in milliseconds; DBP = diastolic blood pressure in mmHg; SBP = systolic blood pressure in mmHg.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Positive and negative ambient mood. Consistent with previous research (Watson et al., 1988), descriptive statistics indicate that participants reported more positive mood ($M = 51.72$, $SD = 11.66$) than negative mood ($M = 26.68$, $SD = 6.12$).

Next, we examined correlations between trait resilience and positive and negative mood, controlling for sex. Supporting Hypothesis 1, trait resilience was positively associated with positive mood ($r = .38$, $p < .01$), but was not associated with negative mood.

Subjective experience in response to task. To test the relations between trait resilience and subjective experience during the speech preparation task, we examined zero-order correlations between trait resilience and ratings of the emotion reports. There were no significant relations between trait resilience and many of the subjective emotion reports. The only exceptions were that higher trait resilience was associated with more happiness ($r = .47$, $p < .01$) and more interest ($r = .33$, $p < .01$). These findings also provide support for Hypothesis 1. Emotion reports for happiness and interest did not differ by sex.

To quantify positive emotionality in a single measure, we created a composite index by summing the standardized scores of positive mood and standardized emotion reports of happiness in response to the speech preparation task.[3] In support of Hypothesis 1, trait resilience was positively related to the positive emotionality composite index ($r = .46$, $p < .001$).

Hypothesis 2: Resilience and Appraisals of Threat

Across all participants, the mean cognitive appraisal of threat was 4.07 ($SD = 1.56$), ranging from 1 to 7. As predicted, higher trait resilience was associated with lower appraisals of threat ($r = -.31$, $p < .05$). Appraisals of challenge–psyched-up were not related to trait resilience. There were no sex differences in cognitive appraisals of threat.

Hypothesis 3: Resilience and Duration of Cardiovascular Reactivity

To test the hypothesis that psychological resilience would predict duration of cardiovascular reactivity, we first used the data reduction technique developed by Fredrickson and Levenson (1998) to quantify the duration of cardiovascular reactivity. The duration of cardiovascular reactivity was calculated as the time elapsed (in seconds) until each participant's indices of cardiovascular reactivity returned to his or her own baseline levels and remained within this interval for 5 of 6 consecutive seconds (for a detailed description, see Fredrickson & Levenson, 1998). Again, following Fredrickson and Levenson (1998), an aggregate index of duration of cardiovascular reactivity was created for each participant by computing the mean duration score across the six cardiovascular indices. Across all participants, the mean duration of cardiovascular reactivity was 29.59 s ($SD = 19.63$).

Next, we examined the relations between psychological resilience and duration of cardiovascular reactivity. Findings revealed support for Hypothesis 3, demonstrating that trait resilience was negatively related to duration of cardiovascular reactivity ($r = -.26$, $p < .05$).

Hypothesis 4: Positive Emotions Mediate

Our final hypothesis stated that positive emotions would mediate the effect of resilience on duration of cardiovascular reactivity following the speech preparation task. The statistical analysis framework suggested by Baron and Kenny (1986) was used to test for mediation effects. This entailed conducting three separate equations. Step 1 is to find a significant correlation between the predictor (trait resilience) and the mediator (positive emotionality), which was supported by Hypothesis 1. Step 2 is to find a significant correlation between the predictor (resilience) on the outcome (duration of cardiovascular reactivity), which was supported by Hypothesis 3. Step 3 is to find a significant correlation between the mediator (positive emotionality) and the outcome (duration of cardiovascular reactivity). Consistent with Step 3, data indicate that positive emotionality was associated with duration of cardiovascular reactivity in response to the speech preparation task ($r = -.22$, $p < .05$, one-tailed). According to Baron and Kenny, if Steps 1–3 are to hold, mediation occurs if the effect of the predictor (trait resilience) has no effect on the outcome (duration of cardiovascular reactivity) when the mediator (positive emotionality) is controlled. Consistent with this final step, the data indicate that the effect of resilience on duration of cardiovascular reactivity was no longer significant when controlling for positive emotionality ($\beta = -.15$), $t(54) < 1$, *ns*.

Next, we examined an alternative mediational model. The model was tested to examine whether cognitive appraisals of threat would mediate the effect of trait resilience on duration of cardiovascular reactivity. Consistent with Step 1, there was a significant correlation between the predictor (trait resilience) and the mediator (appraisal of threat; $r = -.31$, $p < .05$); this was demonstrated by

[3] A principal-components factor analysis of the Ego-Resiliency Scale was conducted across the three samples reported here. From the factor analysis, an Interest factor emerged. Because subjective emotion reports of interest might overlap with the items from the Interest factor of the ego-resiliency measure (J. Block & Kremen, 1996), we did not include subjective emotion reports of interest (from the emotion reports and the positive mood scale) in the composite positive emotionality indices reported throughout. For further details about the factor analysis, please contact Michele M. Tugade.

Hypothesis 2. Step 2 is to demonstrate a significant correlation between the predictor (trait resilience) and the outcome (duration of cardiovascular reactivity); this was demonstrated by Hypothesis 3. We found support for Step 3, which is to find a significant correlation between the mediator (appraisal of threat) and the outcome (duration of cardiovascular reactivity; $r = .21$, $p < .05$, one-tailed). In line with Baron and Kenny's (1986) model of mediation, mediation occurs if the predictor (trait resilience) has no effect on the outcome (duration of cardiovascular recovery) when the mediator (appraisal of threat) is controlled. Consistent with this final step, the data indicate that the effect of resilience on duration of cardiovascular reactivity was no longer significant when controlling for appraisal of threat ($\beta = -.16$), $t(54) < 1$, *ns*.

Discussion

Theoretical writings have indicated that resilient individuals are characterized by high positive emotionality (e.g., J. Block & Kremen, 1996; Klohnen, 1996; Wolin & Wolin, 1993) and by the capacity to rebound from negative circumstances despite threats to the individual (e.g., J. H. Block & Block, 1980; Lazarus, 1993; Masten, 2001). Study 1 provides support for these theories and introduces a new perspective to the existing literature by examining the construct using physiological measures. As well, this study demonstrates the utility of positive emotions in achieving effective emotion regulation.

To date, no studies to our knowledge have directly examined the physiological concomitants associated with psychological resilience. Thus, the present findings extend research on psychological resilience by exploring the construct's physiological qualities. In the present study, a parallelism between psychological and physiological resilience emerged: Those who rated themselves as having high abilities to effectively rebound from stressful encounters also demonstrated this quality physiologically by quickly returning to baseline levels of physiological responding after negative emotional arousal. This parallelism demonstrates that resilience is not just a psychological phenomenon. Rather, the psychological mindset involved with resilience is reflected in the body as well, which has strong implications for research in health psychology. The physiological embodiment of psychological resilience might be used as a further demonstration of how psychological constructs may positively affect physical health.

A notable finding from Study 1 is that the experience of positive emotions appeared to aid resilient individuals in achieving accelerated cardiovascular recovery from negative emotional arousal, compared with those with less resilience who experienced relatively less positive emotions. This finding is in line with the undoing effect of positive emotions (Fredrickson & Levenson, 1998; Fredrickson, Mancuso, et al., 2000), which indicates that one effect of positive emotions is to undo the lingering cardiovascular after effects of negative emotions. Thus, as predicted, the experience of positive emotions is one key element that helps resilient individuals recover quickly from the cardiovascular activation associated with negative emotions. Furthermore, positive emotions may assist in emotion regulation beyond the physiological level. For instance, by facilitating cardiovascular recovery from negative emotions, positive emotions might also help resilient people explore other emotion regulation possibilities by broadening their arrays of subsequent thoughts and actions (Fredrickson, 2000). Finally, it is also possible that this extra time gained can give the body restoration time and toughen it up in preparation for additional stressors should they arise (Dienstbier, 1989).

A related finding of Study 1 was that high-resilient participants appraised the stressful task as less threatening, compared with low-resilient participants. This finding is in line with studies examining cognitive appraisals and physiological responses to stressful events (Tomaka et al., 1993; Tomaka, Blascovich, Kibler, & Ernst, 1997). For instance, cognitive appraisals (e.g., challenge, threat) predict physiological reactions to stressful events, demonstrating that low-threat (i.e., challenge) appraisals are associated with greater cardiac reactivity and less vascular resistance, compared with high-threat appraisals (Tomaka et al., 1993, 1997). Notably, in the present study, cognitive appraisals of threat were also found to mediate the effect of trait resilience on duration of cardiovascular reactivity. In all, then, it appears that positive emotions and cognitive appraisals contribute to the ability for resilient people to recovery quickly from negative emotional arousal.

Study 2

The aim of Study 2 was to examine the role of cognitive appraisals in psychological resilience. Two types of appraisals that have received attention in the stress and coping literature as having different psychological and physiological consequences are those involving threat versus challenge.[4] *Threat appraisals* are those in which the perception of danger exceeds the perception of abilities or resources to cope with the stressor. *Challenge appraisals*, in contrast, are those in which the perception of danger does not exceed the perception of resources or abilities to cope. Threatened individuals perceive the potential for loss, with little, if anything to be gained in the situation. Challenged individuals, however, perceive the possibility of gain (i.e., positive incentives or avoidance of harm) as well as loss in the situation (Lazarus & Folkman, 1984; Smith & Ellsworth, 1985).

Findings from Study 1 raise important questions regarding the role of cognitive appraisals in the emotion regulation process. If, as Study 1 shows, high- and low-resilient individuals differ in their initial appraisals of stressful situations, we predict that low-resilient individuals who are convinced to appraise circumstances in a more positive light should experience the beneficial repercussions of positive emotions that their high-resilient peers exhibit. Specifically, when induced to appraise the speech preparation task as a threat, we would expect to see the same pattern as that found in Study 1: High-resilient participants should experience greater positive emotionality, compared with low-resilient participants (Hypothesis 1). (No predictions are made about the resilience group differences in positive emotionality for those in the challenge condition.) We also predicted that high-resilient participants induced to appraise the speech task as a *threat* would recover more quickly from the arousal generated by the task, relative to low-resilient participants. When induced to appraise the speech prep-

[4] Although some emotions and coping researchers (e.g., Blascovich, Tomaka) consider *threat* and *challenge* as cognitive appraisals, other emotion and appraisal researchers (e.g., Ellsworth, Smith) consider these terms to reflect emotions and not appraisals.

aration task as a challenge, however, low-resilient participants should resemble high-resilient participants in their durations of cardiovascular reactivity (Hypothesis 2). Finally, on the basis of Study 1, we predicted that positive emotions would mediate the effect of resilience on duration of cardiovascular reactivity for those induced to appraise the speech task as a threat (Hypothesis 3).

Method

Participants

Participants were 57 (49% female) undergraduates from the University of Michigan aged 18 to 22 ($M = 18.96$, $SD = .97$). They received course credit for their participation. Forty-six were Caucasian, 6 were ethnic minorities (2 African Americans, 3 Asians, 1 Hispanic), and 5 were of other or unspecified ethnic background.

Appraisal Induction

After receiving instructions for the speech preparation task, by random assignment participants heard one of two verbal instruction sets (adapted from Tomaka et al., 1997). In the challenge condition, participants were told to try to get psyched-up for the task and to think of the task as a challenge to be met and overcome. In the threat condition, participants were told that their performance would be evaluated, and that evaluations of their performance would be used to predict their academic and social success. Specific instructions are presented below:

> *Challenge*: Even though this is a difficult task to complete, try to think of the task as a challenge to be met and overcome. Do your best to get psyched-up for this task. We want you to really try hard to do your best at it. Remember to think of the task as a challenge to be met and overcome and to think of yourself as someone capable of meeting that challenge.
>
> *Threat*: This task is often considered a difficult task to complete, so remember to concentrate on your performance. It is very important that you perform this task as efficiently as possible. The content of your speech, its grammatical correctness, and your delivery style will be evaluated. Remember that your speech will be videotaped and that your performance will be viewed by Michigan professors for evaluation. Researchers will use these evaluations to predict your academic and social success at Michigan.

Measures

Measures of trait resilience, subjective emotion reports, cognitive appraisals of threat, and cardiovascular measures were identical to Study 1. The exceptions were the measures of blood pressure. Because of equipment failure, 26% of the blood pressure data in this sample was unusable. As such, we omitted measures of DBP and SBP from the analyses of Study 2.

Procedure

The procedure of Study 2 resembled that of Study 1. In addition, after participants received instructions for the speech task, they were then randomly assigned to hear one of two instruction sets, emphasizing either challenge or threat. Then, participants rated their cognitive appraisals for the upcoming task. Afterward, participants rated their cognitive appraisals for the task they just completed, provided ratings on an emotion report to describe how they felt while preparing their speech, and provided self-reports of resilience.

Results

Psychological Resilience

Across all participants, the mean resilience score on the J. Block and Kremen (1996) Ego-Resiliency Scale was 41.5 ($SD = 4.68$), ranging from 31 to 53. There were no sex differences in scores of resilience.

Responses to Speech Preparation Task

Cognitive appraisal. As a manipulation check on the experimental induction, participants were asked to rate the extent to which they felt challenged–psyched-up or threatened during the speech preparation task. Because it is possible that participants may have experienced both challenge and threat in response to the task, we first conducted an analysis of covariance (ANCOVA), with appraisal condition as the independent variable and self-reported appraisals of threat as the dependent variable, controlling for self-reported appraisals of challenge–psyched-up. Findings revealed that the participants in the threat condition provided relatively greater self-reports of threat ($M = 5.08$, $SD = 1.44$) compared with those in the challenge condition ($M = 4.50$, $SD = 1.44$), $F(1, 52) = 6.23$, $p < .05$.

Second, we conducted a complementary analysis to examine appraisals of challenge–psyched up. We conducted an ANCOVA, again with appraisal condition as the independent variable, and this time we used self-reported appraisals of challenge–psyched-up as the dependent variable, controlling for self-reported appraisals of threat. Findings revealed that participants in the challenge condition reported experiencing relatively greater self-reports of challenge–psyched-up ($M = 5.21$, $SD = 1.73$) compared with those in the threat condition ($M = 4.28$, $SD = 1.74$), $F(1, 52) = 7.95$, $p < .01$. Together, these findings demonstrate that the experimental manipulation was successful in inducing cognitive appraisals of threat and challenge as intended.

We also examined the relations between trait psychological resilience and self-reported cognitive appraisals of challenge and threat. Results indicate that, across appraisal conditions and sex, trait resilience was positively related to self-reports of challenge–psyched-up ($r = .35$, $p < .01$) and negatively related to self-reports of threat ($r = –.28$, $p < .05$). Together, these indicate that higher resilience is related to greater appraisals of challenge–psyched-up and lower appraisals of threat in response to the speech preparation task.

Subjective experience. As in Study 1, analyses of the emotion reports completed for the speech preparation task confirmed that this task elicited higher levels of anxiety ($M = 2.75$, $SD = 1.99$) and frustration ($M = 3.44$, $SD = 2.64$) than any other emotion. Reports of anxiety and frustration did not differ by sex, appraisal condition, or trait resilience.

Next, as in Study 1, because participants were led to believe that they would deliver their prepared speeches, we examined subjective experiences of the emotion surprise "When you found out you didn't have to give your speech after all." There were no significant differences across all groups ($M = 2.55$, $SD = 2.32$).

Then, we examined group differences in subjective reports in response to the speech preparation task. First, we tested the relations between trait resilience and subjective experience during the speech preparation task by examining zero-order correlations be-

tween trait resilience and ratings of the emotion reports (controlling for sex and appraisal condition). There were no significant relations between trait resilience and the subjective emotion reports. Second, to examine appraisal group differences in subjective experience, we conducted a MANOVA with appraisal condition (challenge, threat) as the independent variable and subjective emotion reports during the speech preparation task as the dependent variables. Compared with those in the threat condition, participants in the challenge condition reported feeling more interested (M = 2.50, SD = 2.21 vs. M = 3.71, SD = 2.27, respectively) and psyched-up (M = 2.23, SD = 2.45 vs. M = 4.14, SD = 2.17, respectively).

Hypothesis 1: Appraisals, Resilience, and Positive Emotionality

We predicted that in the threat condition, participants with higher trait resilience would report greater positive emotionality, compared with those with lower trait resilience. To test this hypothesis, we examined the relations between trait resilience and subjective emotion reports in response to the speech preparation task (for those in the threat condition only). In support of Hypothesis 1, results revealed that higher trait resilience was associated with increases in three positive emotions: eagerness (r = .44, $p <$ .05), excitement (r = .44, $p <$ .05), and happiness (r = .47, $p <$ .05). Following the analytic strategy used in Study 1, we next created a composite index of positive emotionality by summing the reports of eagerness, excitement, and happiness.

Although we made no specific predictions about the subjective experience of those in the challenge condition, analyses indicate that higher trait resilience was associated with increases in three positive emotions: eagerness (r = .55, $p <$ .01), excitement (r = .41, $p <$ .05), and interest (r = .40, $p <$ .05).

Hypothesis 2: Appraisals, Resilience, and Cardiovascular Recovery

Magnitude of cardiovascular reactivity. As in Study 1, we first wanted to assess whether the speech preparation task successfully induced changes from baseline in cardiovascular reactivity. For each participant, and for each cardiovascular measure (HR, FPA, PTF, PTE), we determined mean levels over the 60-s pretask baseline and over the 60-s speech preparation task. These means, averaged across participants, are shown in Table 2. Within-subject t tests confirmed that the cardiovascular reactivity during the speech task was significantly greater than baseline levels for each of the four variables (see Table 2). As with Study 1, these changes indicate clear patterns of sympathetic activation (heart rate acceleration, increased vasoconstriction). Cardiovascular reactivity during baseline and during the speech-preparation task did not differ by sex or trait resilience. One exception is that those in the challenge condition evidenced lower PTE at baseline (M = .18, SD = .02) than those in the threat condition (M = .20, SD = .05), $t(52) = -2.07$, $p <$ .05. Taken together, these findings indicate that the speech task was successful in generating cardiovascular arousal that was different from baseline, and equally so for all participants in the study.

Duration of cardiovascular reactivity. Again, using the data reduction technique developed by Fredrickson and Levenson (1998), we created an aggregate index of duration of cardiovascular reactivity for each participant by computing the mean duration score across the four cardiovascular indices. Across all participants, the mean duration of cardiovascular reactivity was 28.73 s (SD = 23.30). Unexpectedly, men demonstrated faster cardiovascular recovery (M = 21.95, SD = 20.14) compared with women (M = 35.49, SD = 24.61), $t(52) = -2.21$, $p <$ .05.

We also predicted that in the threat condition, high-resilient participants would evidence faster cardiovascular recovery, compared with low-resilient participants. Moreover, we expected that in the challenge condition, there would be no significant differences in cardiovascular recovery by resilience group. To test these predictions, we examined the relations between trait resilience and duration of cardiovascular reactivity for those in the challenge and threat conditions separately. Results revealed support for Hypothesis 2, indicating that among those in the threat condition, higher trait resilience was associated with shorter durations of cardiovascular reactivity (r = –.42, $p <$ .05). In addition, as expected, among those in the challenge condition, no significant differences in trait resilience differences were found.

Table 2
Study 2: Cardiovascular Reactivity During Pretask Baseline and Speech Preparation Task

	Pretask baseline		Speech preparation task	
Variable	*M*	*SD*	*M*	*SD*
HR	77.21	13.26	96.60	20.48***
FPA	2.07	0.34	1.69	0.52***
PTF	0.24	0.02	0.23	0.02**
PTE	0.19	0.04	0.17	0.02***

Note. Asterisks indicate changes significantly different from resting baseline measures by within-subject t tests (df = 38). HR = heart rate in beats per minute; FPA = finger pulse amplitude in millivolts; PTF = pulse transmission time to the finger in milliseconds; PTE = pulse transmission time to the ear in milliseconds.
** $p <$ .01. *** $p <$ .001.

Hypothesis 3: Positive Emotions Mediate

Our final hypothesis stated that, for those in the threat condition, positive emotions would account for the resilience differences in cardiovascular recovery time. As in Study 1, we used Baron and Kenny's (1986) statistical analysis framework to test for mediation effects. Consistent with Step 1, we found a significant correlation between the predictor (resilience) and the mediator (positive emotionality), which was demonstrated by Hypothesis 1. Consistent with Step 2, we found a significant correlation between the predictor (resilience) and the outcome (duration of cardiovascular reactivity), which was demonstrated by Hypothesis 2. Consistent with Step 3, we found a significant correlation between the mediator (positive emotionality) and the outcome (duration of cardiovascular reactivity), r = –.79, $p <$ .001. Mediation was evident, according to the criteria described by Baron and Kenny, because the effect of trait resilience (predictor) on duration of cardiovascular reactivity (outcome) was no longer significant when controlling for positive emotionality (mediator; β = –.18), $t(24) < 1$, *ns*.

Once again, results indicate that when experiencing heightened threat, positive emotions at least partially account for resilience group differences in duration of cardiovascular recovery from negative emotional arousal.

Discussion

Findings from Study 2 provide support for the prediction that positive emotions and appraisals of challenge (vs. threat) are important factors that contribute to psychological resilience. Indeed, these findings are promising because they suggest that those with low levels of psychological resilience are not necessarily destined to poor consequences of emotion regulation: With the use of positive appraisals to generate positive emotion, they also have the capacity to effectively regulate negative emotional experiences. Thus, these results imply that some type of intervention (e.g., one that promotes positive appraisal styles) might be especially useful for low-resilient people.

An important feature of Study 2 was its experimental design. By randomly assigning participants to cognitively appraise the stressor task as either a challenge or a threat, conclusions can be made about the causal influences of appraisals on durations of cardiovascular reactivity for low- and high-resilient people. It is interesting to note that data from Study 2 indicated that, when instructed to appraise the task as a threat (vs. challenge), those with higher psychological resilience evidenced relatively shorter durations of cardiovascular reactivity and relatively greater experiences of positive emotions. These positive emotions, in turn, partially accounted for resilience group differences in durations of cardiovascular reactivity in response to the task.

In contrast, for those instructed to appraise the task as a challenge (vs. threat), durations of cardiovascular reactivity in response to the task did not differ by level of trait resilience. In line with our predictions, when appraising a stressful situation as a challenge, low-resilient individuals may begin to resemble high-resilient individuals who tend to display trait-like positive emotionality. Consequently, this may have allowed low-resilient individuals to demonstrate a trait-like physiological quality associated with positive emotions as well. These findings suggest that low-resilient individuals can benefit from both positive appraisals and positive emotions during the coping process.

Although Studies 1 and 2 have established the beneficial role of positive appraisals and positive emotions in the emotion regulation processes of high- and low-resilient individuals in a laboratory setting, there are limitations in these designs. A foremost limitation is that one is unable to make generalizations to situations when stressors are not laboratory-induced. How might these emotion regulation processes be reflected in the ongoing occurrences of everyday life? Study 3 examines how high- and low-resilient individuals negotiate the negative circumstances that they face daily. The objective is to understand psychological resilience, positive emotions, and emotion regulation in naturally occurring (as opposed to laboratory-induced) stressors of everyday life.

Study 3

Research has shown that some people are able to experience positive emotional and health outcomes from their negative life circumstances by allowing themselves to find benefits within crises or adversity (e.g., Affleck & Tennen, 1996; Tennen & Affleck, 1999) or in ordinary life events (Folkman, 1997; Moskowitz, Folkman, Collette, & Vittinghoff, 1996). These findings lend credence to the idea that finding positive meaning in a situation (i.e., benefits, lessons to learn) is important to well-being. It gives distressed individuals the needed psychological lift to help them continue and move forward in their lives. Moreover, coping benefits are likely to accrue because the broadening effects of positive emotion increase the likelihood that individuals find positive meaning in stressful circumstances. It is important to note that the relation between positive meaning and positive emotions is considered reciprocal: Finding positive meaning not only triggers positive emotion, but also positive emotions—because they broaden thinking—should increase the likelihood of finding positive meaning in subsequent events (Fredrickson, 2000). Study 3 tests the prediction that positive emotions are associated with resilient individuals' ability to find positive meaning in negative circumstances. We predicted that compared with low-resilient individuals, high-resilient individuals would experience greater positive emotionality (Hypothesis 1) and would more likely find positive meaning in their negative circumstances (Hypothesis 2) when compared with low-resilient individuals. Finally, on the basis of Studies 1 and 2, it is also predicted that the experience of positive emotions would mediate the effect of psychological resilience on positive-meaning finding (Hypothesis 3).

Method

Participants

Participants were 192 (65% female) undergraduates at the University of Michigan, aged 18 to 23 ($M = 18.89$, $SD = .95$). They received course credit for their participation. One hundred forty-three were Caucasian, 49 were ethnic minorities or of unspecified ethnic background (8 African Americans, 21 Asians, 4 Hispanics, and 16 others).

Measures

Measures of psychological resilience, subjective emotion reports, and positive and negative ambient mood were identical to those reported in Study 1.

Current problem essays. Participants were asked to do the following:

> Write about the most important personal problem you are currently facing in your life. Write about the experience in as much detail as you can. Really get into it and freely express any and all emotions or thoughts that you have about the experience. As you write, do not worry about punctuation or grammar; just really let go and write as much as you can about the experience.

Then, participants responded to the following open-ended questions: What is the significance of these current circumstances? What kind of sense can you make of these circumstances? Will there be any long-term consequences of these circumstances?

Positive-meaning finding. To assess the degree to which participants found positive meaning in their current problem, participants completed items from Moos's (1988) Coping Responses Inventory as follows: (a) Have you reminded yourself how much worse things could be? (b) Have you thought about how you are much better off than other people with similar problems? (c) Have you thought about how this event could change your life in a positive way? (d) Can you envision anything good coming out of dealing with this problem? Ratings were made on a 5-point scale (A =

no; B = *yes, once or twice*; C = *yes, sometimes*; D = *yes, fairly often*; E = *not applicable*; Moos, 1988). Other items were created for this study as follows: (a) To what extent do you feel that you might find benefit in this situation in the long-term? (b) How likely is it that there is something to learn from the experience? Ratings for these items were made on a 7-point scale, ranging from 1 (*not at all*) to 7 (*extremely*). To quantify positive-meaning finding, an aggregate index of positive meaning was created for each participant by computing the sum of the standardized scores of the six items of positive-meaning finding ($\alpha = .81$). Responses of *not applicable* were considered missing.

Procedure

Participants were run in small groups in a room with desks separated by partitions to ensure privacy. On arrival, participants were greeted by an experimenter who introduced the session as a study on emotions. After signing a consent form, participants were asked to provide demographic information and provide self-reports of ambient mood and psychological resilience. Participants were then asked to write short essays about the most important problem they were currently facing. Afterward, participants completed an emotion report form to indicate the extent to which they felt a number of different emotions in response to the problem they described. Then, participants rated the degree to which they found positive meaning within the problem they described. On completion of the experimental packet, participants were debriefed, thanked, and provided with the phone number of the university psychological counseling center should they need their services.

Results

Psychological Resilience

To assess trait psychological resilience, we examined participants' responses to the Ego-Resiliency Scale (J. Block & Kremen, 1996; $M = 42.4$, $SD = 5.06$, range = 29–56). There were no significant differences by sex or ethnicity.

Characteristics of Current Problem

Analyses of the emotion reports confirmed that the participants' problems elicited higher levels of frustration than any other emotion ($M = 5.16$, $SD = 2.56$). Women reported greater frustration ($M = 5.68$, $SD = 2.37$) than did men ($M = 4.25$, $SD = 2.64$), $t(186) = -3.82$, $p < .0001$. Reports of frustration did not differ by level of trait resilience or ethnicity.

Two trained coders independently coded each of the participants' essays and categorized them based on the main source of the problem described (categories adapted from Park, Cohen, & Murch, 1996). The events that were described as *the most important personal problem* involved (a) problems in a romantic relationship (e.g., "Broke up with my boyfriend;" 25.5%), (b) academic performance problems (e.g., "Can't keep up with work;" 13.0%), (c) relationship problems with a friend (e.g., "I had a falling out with my roommate;" 9.9%), (d) family-related event (e.g., "My parents got divorced;" 7.3%), (e) moving away–starting college (6.8%), (f) illness–accident experienced by another (e.g., "My best friend has cancer;" 4.2%), (g) illness–accident (e.g., "I have an eating disorder;" 2.1%), (h) death of significant other (1%), and (i) other events that were too infrequent for separate categorization (30.2%). On average the source of the events occurred within the last month (74.0%), with the remaining onset of events occurring 1 month to 1 year ago (21.4%) and more than 1 year ago (3.6%). The frequencies of these categories did not differ by sex, ethnicity, or level of trait resilience.

Hypothesis 1: Resilience and Positive Emotionality

To test the hypothesis that participants with higher trait resilience would report greater positive emotionality compared with those with lower resilience, we examined self-reported positive (and negative) ambient mood, as well as subjective reports in response to the problems that participants described.

Positive and negative ambient mood. To measure ambient mood, we examined the modified PANAS, as in Study 1. Descriptive analyses indicate that, consistent with previous research (Watson et al., 1988), participants reported more positive mood than negative mood: Across all participants, the mean positive mood score was 49.93 ($SD = 11.75$), and mean negative mood score was 31.25 ($SD = 10.68$).

To test for group differences, we examined the relations between sex, ethnicity, and trait resilience in ambient mood, separately for positive and negative mood. First, we conducted a 2 × 2 ANOVA, with sex and ethnicity as independent variables, to investigate possible differences in positive mood. A main effect for sex emerged, $F(1, 189) = 5.23$, $p < .05$, with men reporting greater positive mood ($M = 52.49$, $SD = 10.53$) compared with women ($M = 48.53$, $SD = 12.04$). A main effect for ethnicity also emerged, $F(1, 189) = 8.74$, $p < .01$, with Caucasian participants reporting greater positive mood ($M = 51.59$, $SD = 10.71$) than non-Caucasians ($M = 45.85$, $SD = 12.96$). Given the unequal sample sizes (Caucasian: $n = 143$, non-Caucasian, $n = 47$), this finding should be interpreted with caution. There was no Sex × Ethnicity interaction for positive mood. Finally, supporting Hypothesis 1, results indicate that trait resilience was positively correlated with positive mood ($r = .29$, $p < .0001$). There were no effects for sex, ethnicity, or trait resilience for negative mood.

Subjective experience. Analyses of the emotion reports indicated that higher resilience was associated with increases in four positive emotions: eagerness ($r = .17$, $p < .05$), excitement ($r = .19$, $p < .05$), happiness ($r = .21$, $p < .05$), and interest ($r = .18$, $p < .05$). This finding provides further support for our Hypothesis 1.

Next, we conducted a 2 × 2 MANOVA with sex and ethnicity as independent variables, and emotion reports of eagerness, excitement, happiness, and interest as dependent variables, to examine possible differences in sex or ethnicity. Two sex differences emerged: Compared with women, men reported being more excited ($M = 3.18$, $SD = 2.55$ vs. $M = 2.05$, $SD = 2.42$, respectively), $F(1, 183) = 9.89$, $p < .01$, and happy ($M = 3.12$, $SD = 2.53$ vs. $M = 1.95$, $SD = 2.35$, respectively), $F(1, 183) = 11.10$, $p < .01$. There were no ethnic differences in reports of eagerness, excitement, happiness, or interest.

A composite index of positive emotionality was then calculated by summing the standardized scores of positive mood and self-reported eagerness, excitement, and happiness in response to the problem situation described. Trait resilience was positively correlated with the positive emotion index ($r = .32$, $p < .0001$).

Hypothesis 2: Resilience and Finding Positive Meaning

Across all participants, the mean positive meaning index was 21.73 ($SD = 5.19$), ranging from 7 to 30. No significant differ-

ences were found by sex or ethnicity. A Pearson product–moment correlation revealed that the composite index of positive emotionality was positively correlated with the index of positive-meaning finding ($r = .35, p < .0001$).

Our second hypothesis stated that relative to low-resilient individuals, high-resilient individuals would find greater positive meaning in their problem situations. As predicted by Hypothesis 2, higher trait resilience was associated with greater positive-meaning finding ($r = .27, p < .001$).

Hypothesis 3: Positive Emotions Mediate

Our final hypothesis stated that positive emotions would mediate the effect of resilience on positive-meaning finding. Again, Baron and Kenny's (1986) test was used to test for mediation effects. Step 1 is to find a significant correlation between the predictor (trait resilience) and the mediator (positive emotionality), which was supported by Hypothesis 1. Step 2 is to find a significant correlation between the predictor (trait resilience) on the outcome (positive-meaning finding), which was supported by Hypothesis 2. Step 3 is to find a significant correlation between the mediator (positive emotionality) and the outcome (positive-meaning finding). Consistent with Step 3, data indicate that positive emotionality was associated with the positive-meaning finding ($r = .44, p < .0001$). According to Baron and Kenny, if Steps 1–3 are to hold, mediation occurs if the effect of the predictor (trait resilience) has no effect on the outcome (positive-meaning finding) when the mediator (positive emotionality) is controlled. Consistent with this final step, the data indicate that trait resilience was no longer a significant predictor of positive-meaning finding when controlling for positive emotionality ($\beta = .16$), $t(189) = 2.36$, *ns*. These findings provide support for Hypothesis 3: Experiences of positive emotions appear to be critical in helping individuals find positive meaning in negative situations.

Discussion

Study 3 moved beyond laboratory-induced stressors to examine the ways in which resilient individuals cope with negative situations in their daily life. Individual differences in psychological resilience predicted the ability to find positive meaning in negative circumstances. Both high- and low-resilient individuals reported equal levels of frustration in response to the most important problem they described. Differences emerged, however, in participants' reports of positive emotions: Even before they described their most important current problem, high-resilient participants reported higher levels of positive ambient mood. Then, when they were asked about how they felt in response to the problem they described, high-resilient individuals reported feeling more eagerness, excitement, happiness, and interest amidst their high level of frustration, compared with low-resilient individuals. As predicted by the broaden-and-build theory (Fredrickson, 1998, 2001), positive-meaning finding was mediated by experiences of positive emotion.

It is important to note that positive emotions and positive-meaning finding are similar, yet distinct, concepts. Positive emotions can beget positive-meaning finding, which by consequence, can beget further experiences of positive emotions. In this way, positive-meaning finding represents the broadening of one's mind-set when coping, which subsequently helps to build psychological resources, like resilience. This cycle can continue in an "upward spiral" toward enhanced emotional well-being (Fredrickson & Joiner, 2002). In line with this idea, Study 3 demonstrated the beginnings of a potential cycle that might strengthen one's capacity to cope with negative experiences. Recurrent experiences of positive emotion will likely increase the possibility that an individual will find positive meaning and make positive appraisals in subsequent stressful events, providing both short-term and long-term benefits to an individual.

Although Study 3 revealed informative data about the coping strategies used in the day-to-day life of low- and high-resilient individuals, there are, nonetheless, limitations to its design. For instance, given the methodology used in Study 3, it is difficult to disentangle whether those who are better adjusted to their negative circumstances (high-resilient participants) are more likely to construe the positive aspects of their problems or whether positive outcomes lead high-resilient individuals to perceive more positive meaning in negative circumstances. An experimental design would help determine the possible causal directions of these factors.

Future studies could also examine other factors that contribute to the effects revealed by Study 3. One possibility is that high-resilient participants gained more from writing about their problem situations, which consequently allowed them to find more positive meaning in their circumstances, compared with the low-resilient participants. A number of studies have found that the very act of writing about problems has positive effects (e.g., Pennebaker, Kiecolt-Glaser, and Glaser, 1988). Thus, drawing from these studies and the findings of Study 3, it is possible that the degree of benefits derived from writing may be one other mediating factor that can account for the differences in positive-meaning finding reported in the present study.

General Discussion

The broaden-and-build theory states that positive emotions broaden an individual's thought–action repertoire, which in turn helps to build that individual's personal resources (Fredrickson, 1998, 2001). This theory was used as a framework for understanding the construct of psychological resilience. Three studies explored the benefits of positive emotions in fueling psychological resilience to stressful events. Mediational analyses indicated that the experience of positive emotions might have contributed to the ability to achieve efficient emotion regulation, as demonstrated by accelerated cardiovascular recovery from negative emotional arousal (Studies 1 and 2) and by finding positive meaning in negative circumstances (Study 3).

It is important to note that perceiving threat in negative experiences has adaptive benefits (e.g., when dealing with immediate, negative circumstances). In prolonged periods, however, this negative appraisal style can have deleterious effects on one's psychological and physical well-being (Folkman & Lazarus, 1985; Tomaka et al., 1997). For instance, studies have shown that a tendency to appraise situations as a threat is related to increased risk for coronary heart disease (Monat & Lazarus, 1991). In contrast, a positive appraisal style can have beneficial effects on one's well-being (Park & Folkman, 1997). Thus, as these studies and Studies 1 and 2 show, positive appraisals have benefits to one's physical and psychological well-being.

Throughout this research, we found that high-resilient individuals tend to experience positive emotions even amidst stress. Some might argue that these effects reflect unbridled optimism, or the so-called "Pollyanna effect," in which individuals have a tendency to focus on more pleasant information, they do not recognize the severity of problems, and they perceive no harm in stressful situations (Matlin & Gawron, 1979). According to this interpretation, resilient individuals may not care or are relatively unconcerned about their problems.

Although there may be merit to this interpretation, it fails to acknowledge the two coexisting preconditions that describe resilient individuals, which include their abilities (a) to recognize the effects of stressful situations and (b) to experience positive outcomes despite sources of adversity (Masten, 2001). Together, these characteristics set trait resilience apart from similar constructs, such as optimism. Along these lines, the high-resilient participants in our research did not appear blind to negativity: Findings indicated they experienced high levels of anxiety and frustration, indicating that they did indeed recognize the negativity of the stressful situations they encountered (i.e., were not Pollyannish), yet they were able to experience positive emotions even amidst these negative emotions. Thus, positive emotions amidst stress may have advantages in the coping process.

An important finding in the current research is that positive emotions contribute to the ability for resilient individuals to physiologically recover from negative emotional arousal. This finding may be especially important in examining the health-promoting qualities associated with positive emotions. Cardiovascular reactivity occasioned by negative emotional states of hostility, anger, and anxiety plays an important role in the etiology of cardiovascular diseases, such as coronary heart disease and essential hypertension (for reviews, see Blascovich & Katkin, 1993). Sustained experiences of negative emotional arousal have been shown to be associated with long-term cardiovascular illness and disease. Thus, it appears especially useful to understand how positive emotions might contribute to the prevention of cardiovascular disease.

As well, we found that trait-like positive emotionality contributes to resilient people's abilities to rebound physiologically from negative emotional events. This might help explain the salubrious physical health effects associated with positive emotional states. For example, individuals with greater tendencies to use humor to cope (Lefcourt, Davidson-Katz, & Kueneman, 1990) and who report daily positive mood (Stone et al., 1994) have stronger immune system defenses. In addition, people who are able to regain and maintain positive emotional states are less likely to get sick or to use medical services when faced with stressful events (Goldman, Kraemer, & Salovey, 1996). The tendencies to maintain positive emotions act as resources to buffer against the advancement of disease and death (Aspinwall & Taylor, 1997; Taylor, Kemeny, Reed, Bower, & Gruenewald, 2000).

Future Directions

The present research adopted a multimethod approach that used self-report, physiological, qualitative, and experimental data in attempts to understand psychological resilience. These methods proved fruitful in discovering the influential role of positive emotions in coping for low- and high-resilient people. Note that they provide convergent validity on the self-report measure of resilience (J. Block & Kremen, 1996) used throughout this study.

Nonetheless, many questions remain that can be the focus of future studies. First, it would be useful to measure psychological resilience using other methods, beyond self-report. We employed a self-report scale of psychological resilience (J. Block & Kremen, 1996), which is useful in gaining a basic understanding of how a psychological framework can be related to cognitive (appraisals) and physiological (cardiovascular recovery) outcomes. Beyond self-reports, peer reports could corroborate the results found here. Another method, experience sampling, could reveal the temporal dynamics of psychological resilience: Do levels of psychological resilience vary in different situations? Are people able to become more resilient through time? Do repeated experiences of positive emotion indeed help build psychological resilience? Are there other mediating or moderating factors that account for varying degrees of psychological resilience? These questions merit further investigation.

Summary

The broaden-and-build theory (Fredrickson, 1998, 2001) predicts that positive emotions are useful in several ways. The present research expanded this theory into the realm of coping, suggesting that positive emotions guide present coping behavior. By examining psychological resilience from subjective, cognitive, and physiological angles, the present investigation provides greater insight into the reasons why resilient individuals are able to effectively cope with stressful experiences, whereas others facing similar conditions do not fare as well. Resilient individuals may recognize the benefits that positive emotions have on negative emotion regulation. As proposed by the broaden-and-build theory (Fredrickson, 1998, 2001), experiences of positive emotions during times of stress prompt individuals to pursue novel and creative thoughts and actions. Thus, through exploration and experimentation, in time they may be able to build an arsenal of effective coping resources that help buffer (psychologically and physiologically) against negative emotional life experiences.

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