

UC Riverside

UC Riverside Electronic Theses and Dissertations

Title

Secondary Appraisal Moderates the Valence of Demand

Permalink

<https://escholarship.org/uc/item/8r23x487>

Author

Kruse, Elliott

Publication Date

2013

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA
RIVERSIDE

Secondary Appraisal Moderates the Valence of Demand

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Psychology

by

Elliott Kruse

August 2013

Dissertation Committee:

Dr. Thomas Sy, Co-Chairperson

Dr. Sonja Lyubomirsky, Co-Chairperson

Dr. Howard Friedman

Copyright by
Elliott Kruse
2013

The Dissertation of Elliott Kruse is approved:

Committee Co-Chairperson

Committee Co-Chairperson

University of California, Riverside

Acknowledgments

Let me begin by first apologizing for the brevity of my acknowledgments. If I thanked everyone who contributed to my life in grad school, the section would require an abstract.

First and foremost, I want to thank Faye Harmer and Renee Young. They got me out of more scrapes than anyone else in grad school.

Second, I would like to thank my committee. Tom Sy taught me to attend to details and to carefully explain the mechanism of the effect. Sonja taught me to get the writing right and to attend to details. I had to learn that lesson twice. Howard once wrote on a student paper of mine, “Clever ideas – don’t let ‘the system’ drum them out of you,” which was probably the highest praise I ever received in grad school. I would also like to thank Kate Sweeny, from whom I learned how to write a review paper, and Dan Ozer, who was always incredibly patient when I cornered him with a stats question.

Next, I would like to thank my friends, with whom I spent many hours talking, joking, and commiserating, but mainly drinking craft beer and playing card games.

Originally I wrote out a list of names with small notes for each one, but it always felt incomplete. Instead of risk losing friends, I will just instead thank you in person.

However, a short list of people who helped make grad school worthwhile includes: Philip Vieira, Sarah Santiago, Loren Albeg, Arezou Ghane, Jonny Lovelace, and Sarah Baylus. I do want to specifically *not* acknowledge Jasa and Brad Orion; they are jerks.

Finally, I would like to thank my family. They are all athletic, charismatic, and good-looking, so I appreciate that they let me stay a member. To my father, thank you for

teaching me to work hard and try everything. To my mother, thank you for teaching me to respect others and be respected. Also, I would like to particularly thank my siblings, who had 4 children in total across my time in grad school. From an evolutionary perspective, you have made me very successful.

Thank you.

ABSTRACT OF THE DISSERTATION

Secondary Appraisal Moderates the Valence of Demand

by

Elliott Kruse

Doctor of Philosophy, Graduate Program in Psychology

University of California, Riverside, August 2013

Dr. Thomas Sy, Co-Chairperson

Dr. Sonja Lyubomirsky, Co-Chairperson

Demand is a perceived need to exhaust resources to manage a situation. Although previous models of demand and stress have acknowledged the existence of potential gain in these taxing situations, they have focused primarily on the potential for loss. The present research tests a multivalence extension of the transactional model of stress to address the role of secondary appraisal in positively-valenced demand. Across three experiments, I demonstrate that secondary appraisal moderates the relationship between demand and valence, as well as an important cognitive outcome: problem solving. When secondary appraisal is high, demand increases positive valence and improves problem-solving performance. When secondary appraisal is low, demand increases negative valence and impairs problem-solving performance. These results are consistent with the theoretical structure of eustress and demonstrate the need to further explore positively-valenced demand in stress research.

Table of Contents

Acknowledgments	iv
Abstract	v
Introduction	1
Study 1a	12
Study 1b	17
Study 2	20
General Discussion	25
References	32
Tables	40
Figures	52
Appendices	58

Lists of Tables

Table 1: Demographics by Study	41
Table 2: Correlations between Measures in Study 1a	42
Table 3: Positive Valence as a Function of Condition and Secondary Appraisal in Study 1a	43
Table 4: Negative Valence as a Function of Condition and Secondary Appraisal in Study 1a.....	44
Table 5: Correlations between Measures in Study 1b	45
Table 6: Performance on Remote Associates Test as a Function of Experimental Condition and Secondary Appraisal in Study 1b	46
Table 7: Number of Problems Attempted on Remote Associates Test as a Function of Experimental Condition and Secondary Appraisal in Study 1b	47
Table 8: Correlations between Measures in Study 2	48
Table 9: Manipulation Checks for Study 2	49
Table 10: Positive Valence as a Function of Experimental Condition in Study 2	50
Table 11: Negative Valence as a Function of Experimental Condition in Study 2	51
Table 12: Number of Problems Answered Correctly as a Function of Experimental Condition in Study 2	52

List of Figures

Figure 1: Theoretical predictions about valence of stress from Kruse & Sweeny (2013)	53
Figure 2: Positive valence appraisal as a function of secondary appraisal and experimental condition in Study 1a	54
Figure 3: Negative valence appraisal as a function of secondary appraisal and demand condition in Study 1a	55
Figure 4: Number of RAT problems correctly solved in control and demand conditions as a function of secondary appraisal in Study 1b	56
Figure 5: Positive valence appraisal by experimental condition in Study 2	57
Figure 6: Problems answered correctly by experimental condition in Study 2	58

List of Appendices

Appendix 1: Timeline for All Studies	59
Appendix 2: Initial Instructions	60
Appendix 3: Task Description and Instructions.....	61
Appendix 4: Experimental Manipulations.....	62
Appendix 5: Demand Manipulation Check	63
Appendix 6: Manageability Manipulation Check	64
Appendix 7: Primary Appraisal / Secondary Appraisal Measure.....	65
Appendix 8: Valence Appraisal Measure	66
Appendix 9: Remote Associates Test	67
Appendix 10: Arithmetic Pre-test	68
Appendix 11: Arithmetic Task	69
Appendix 12: Positive and Negative Affect Schedule	70

Secondary Appraisal Moderates the Valence of Demand

Accomplishment is difficult, often stressful, and, with the exception of dissertations, rewarding. Pursuing accomplishment elicits a desirable kind of stress – that is, stress caused by demands that *are* desirable because they lead to “gain and growth” (Selye, 1974). Although these positively-valenced demands were acknowledged 40 years ago, very little research has since materialized exploring their dimensions. Indeed, so thoroughly have stress and negative valence become interwoven that the transactional model, the predominant model of human stress, explicitly defines stress as requiring a sense of threat (Lazarus & Folkman, 1984, p. 14). Although the transactional model and the contemporary models built upon it (Blascovich, 2008; Cavanaugh, Boswell, Roehling, & Boudreau, 2000; Dienstbier, 1989) propose that individuals appraise potentially beneficial demands as “challenges,” demand is still assumed to imply threat. Little evidence exists for this assertion and, to the contrary, contemporary research indicates that positively-valenced demands can also elicit stress (Merali, McIntosh, Kent, Michaud, & Anisman, 1998; Merali, Michaud, McIntosh, Kent, & Anisman, 2003).

Almost no research addresses how positively-valenced demands relate to the stress process. If the two valences of stress are equally common, then this omission is notable. Potentially half of the human stress experience is relatively unexplored and this unplumbed territory may hold important theoretical and practical insight. For example, evidence from related models suggests striking differences between the two valences of demand: Both correlational research on organizational outcomes (i.e., challenge/hindrance stress; Cavanaugh et al., 2000) and experimentation on physiological

outcomes (i.e., challenge/threat appraisal; Blascovich, 2008) reveal divergent relationships between the two factors of stress and their respective outcomes. Further research on this difference is necessary to understand the structure of stress.

However, although stress is a much-researched topic, it is a vaguely-defined term that can refer to the initial demand, the effect of demand on its outcomes, or the individuals' management of those demands. To both clarify this confusion and provide sharper theoretical focus, the present research focuses on demand itself. Although the following sections will address stress, it is used to explore the theoretical structure of demand, as current research on demand is almost exclusively a subdomain of stress. My theoretical framework, as well as the subsequent studies based upon it, is focused on demand.

In this paper, I test two core propositions of my multivalence framework of demand that extends the transactional model (Kruse & Sweeny, 2013). First, I examine whether the manageability of a demand relates to its apparent valence (Figure 1). Second, I explore whether the interaction between manageability and demand in turn relate to improvement and impairment of a cognitive outcome: problem solving. In particular, to address a critical absence in the literature, I focus on positive demands and improvements of problem solving as potential indicators of eustress.

Demand and Valence

Demand is a perceived environmental feature in which a task or situation requires the exhaustion of resources to manage (Blascovich, 2008; Dienstbier, 1989; Hobfoll, 1989) and is a key component of the stress process (Lazarus & Folkman, 1984).

Examples of demanding situations include difficult final exams, high-stakes negotiations, and challenging relationships. What these situations have in common is that they are taxing. Resources, in turn, are aspects of the environment or self that are intrinsically valued (e.g., happiness, respect) or are means to those ends (e.g., money, social support; Diener & Fujita, 1995; Hobfoll, 2002). Depending on prospective shifts in resources, demands may be perceived to have a valence.

In contemporary research, the term “valence” has two definitions. One refers to whether a stimulus is attractive or repulsive (i.e., motivational valence; Lewin, 1935) and the other is whether an experience is pleasurable or painful (i.e., hedonic valence; Barrett & Bliss-Moreau, 2009). One of the first constructs relevant to positively-valenced demand, “eustress” (Selye, 1974), referred to stresses and demands that lead to gain and growth whereas “distress” referred to those with aversive consequence. Following Selye's definition, positively-valenced demands are those defined by desirable outcomes and so, in the context of demand, valence is motivational, not hedonic. As will be elaborated in the next section, eustress is not reducible to “stress that feels good,” although it likely often does, but rather “stress caused by things that are desirable.” Examples of positively valenced demands include fruitful business opportunities, adventurous romances, and heartfelt artistic creation, whereas examples of negatively-valenced demand include toxic work environments, overwhelming financial debt, and being physically intimidated. The valence of a demand is determined by the quality of its potential outcomes.

Contextualizing Positive Demands in Stress

Previous models of human stress include constructs similar to positively-valenced demand, but differ in the roles of threat and secondary appraisal. In the transactional model, stress occurs when an individual perceives that a situation both taxes or exceeds their available resources and threatens their well-being (Lazarus & Folkman, 1984). The same stimulus may be stressful or not, depending on a person's evaluation of it. For example, jumping out of an airplane may be incredibly distressful to one person but exhilarating to another.

The work of this evaluation is done by two appraisals, primary and secondary. In the primary appraisal, individuals assess the significance of the stressor, what it means to the individual, and what the potential outcomes of the demand are. For example, if a supervisor makes a subtle comment about workplace tardiness, an employee may perceive that as a veiled threat. Secondary appraisals address the individual's cognitive and behavioral options for coping with the stressor. For example, this same employee may consider that, to respond to the threat, they could start coming into work on time or they could transfer to a unit with a different supervisor. Stress in turn leads to coping, wherein the individual attempts to manage the demand (Lazarus & Folkman, 1984; Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen, 1986). These processes interact to determine whether a prospective stressor is perceived and anticipated as a threat (generally negative) or a challenge (both positive and negative). Although challenges are related to positively-valenced demand, they require a sense of threat and so are more similar to mixed-valenced demands. The construct of challenge does not necessarily address primarily beneficial demands.

Related models also include constructs similar to positively-valenced demand but differ in a theoretically important way. In the organizational literature, challenge stress is caused by demands that are pressure-laden but worthwhile and have a high likelihood of success (e.g., responsibility, time pressure), whereas hindrance stress refers to those that interfere with individuals' ability to pursue their goals (e.g., red tape, organizational politics; Cavanaugh et al., 2000). However, as the challenge stress builds on the transactional model, even beneficial stressors are proposed to be aversive (LePine, Podsakoff, & LePine, 2005; Podsakoff, LePine, & LePine, 2007). Additionally, evidence from the biopsychosocial model indicates the existence of “challenge appraisal” and “threat appraisal,” which occur when resources meet demand and when demands exceed resources, respectively (Blascovich, 2008; Blascovich & Tomaka, 1996). Demand is defined as effort, uncertainty, or danger (Blascovich & Mendes, 2000) and so, much like the present framework, threat is not necessary. However, the biopsychosocial model does not include other forms of valence as core processes (Seery, Weisbuch, & Blascovich, 2009), so does not directly address positively-valenced demands.

Finally, researchers have also explored positive valence in stress in other avenues. For example, “uplifts” are quotidian positive experiences, such as an unexpected thank you note or a favorite song on the radio (Kanner, Coyne, Schaefer, & Lazarus, 1981). However, uplifts are not themselves taxing; to the contrary, they frequently play a restorative role in stress (Lazarus, Kanner, & Folkman, 1980). Similarly, positive emotions have also been shown to play an important role in stress processes (Folkman & Moskowitz, 2000). Much like uplifts, however, positive emotions are not themselves

positively-valenced demands. The constructs are related, as demands may evoke positive emotions (e.g., joy, fulfillment, flow) and positive emotions may elicit demand (e.g., interest, love, authentic pride), but they are different. For example, curiosity is an emotional-motivational system that orients individuals towards novelty and challenge (Berlyne, 1978; Loewenstein, 1994); it directs individuals to gainful demand, but is not itself gainful demand. No current model fully elaborates or emphasizes the role of positively-valenced demands. Where gain and positive valence do occur in contemporary models of demand, they either do so as potential benefits from threatening stressors (Lazarus & Folkman, 1984; Cavanaugh et al., 2000) or as a respite from negative valence (Lazarus et al., 1980).

Extending the Transactional Model

The multivalence extension of the transactional model developed out of an exploration of the implications of “eustress,” or stress that leads to gain and growth. For the purposes of the present research, I focus on two important extensions. First, my framework does not require that stress involves threat. Although a large body of research indicates that stress frequently involves threat, little evidence directly challenges whether stress requires threat. To the contrary, recent evidence suggests that positively-valenced demands can also elicit stress (Merali et al., 1998; Merali et al., 2003). Following this theoretical expansion, the domain of the primary appraisal is extended to more strongly emphasize the potential for positive outcomes as a source of demand. As stated earlier, although “challenge” exists in extant models, it occurs when an aversive stressor also has benefits, not when a primarily gainful scenario is highly taxing.

Note, however, that this expanded definition does not preclude threat, even in gainful situations. In the complex milieu of human stress, both valences of stress likely co-occur as individuals are capable of perceiving both potential outcomes in ambiguous situations (Helgeson, Reynolds, & Tomich, 2006; Marshall, Wortman, Kusulas, Hervig, & Vickers, 1992). In other words, threat is a sufficient but not a necessary condition.

Additionally, once both positive and negative demands are included, the role of the secondary appraisal may also be expanded. Previous research on secondary appraisal focused on its relationship with coping (e.g., Folkman & Lazarus, 1980; Folkman et al., 1986). Although coping has a broad definition, not specifically mentioning threat and instead referring to any effort to manage a demand (Folkman et al., 1986; Lazarus & Folkman, 1984), in practice it has been examined in terms of its ability to mitigate distress. For example, in the “Ways of Coping” questionnaire (Folkman & Lazarus, 1985), items 17, 29, and 34 explicitly refer to a “problem,” implying that the demand is unwanted, rather than beneficial. Several other items, such as 39 (“I didn't let it get to me; I refused to think too much about it”) and 43 (“I kept others from knowing how bad things were”), among others, also imply an aversive demand and would be inappropriate for measuring response to a desirable demand. A few, such as item 5 (“I bargained or compromised to get something positive from the situation”), do acknowledge the potential for benefit, but in the context of a threatening situation. Coping has a broad theoretical definition but a narrow practical one.

In line with the inclusion of positive valence, secondary appraisal may also relate to the maximization of benefit from gainful demands, or “capitalizing” (Langston, 1994).

This process occurs when individuals can positively influence the impact of a stressor's outcome (Bryant, 1989). It may involve increasing either the objective benefit (e.g., getting extra credit or negotiating higher pay) or the subjective reward from a demand (e.g., savoring; Bryant & Veroff, 2007).

Building on these theoretical extensions, I propose that secondary appraisal plays a role in determining the valence of demand. This proposition is novel because previous theories separated manageability from valence. Although “challenges” are defined as those that are beneficial and manageable (Lazarus & Folkman, 1984), this definition does not imply that things that are manageable are themselves beneficial. This framework provides a point of contact between the two appraisals.

If the valence of a demand is determined by a prospective shift in resources, both positively and negatively, then processes that influence the perceived shift in resources should influence the valence of the demand. As the perceived gains from a task are a function of the size of the gain and the probability of the gain (i.e., expected value; Knutson, Taylor, Kaufman, Peterson, & Glover, 2005), changing the probability of a gain should influence the valence of the demand. For example, appraising a demand as manageable (i.e., high secondary appraisal) should in turn increase the probability of reward and decrease the probability of loss, because the individual has the capacity to effect more desirable and less aversive outcomes (Kruse & Sweeny, 2013). This effect may be strongest when a demand has a neutral or unclear valence. Given this framework, my hypotheses are:

H1: Secondary appraisal moderates the valence of demand.

H1a: When secondary appraisal is high, demand is appraised positively.

H1b: When secondary appraisal is low, demand is appraised negatively.

Problem Solving as Outcome

The potential importance of positive valence in research on demand extends beyond whether desirable and demanding situations can be stressful. Positively-valenced demands may play a role in disambiguating one of the most inconsistent aspects of stress: its effect on its cognitive outcomes. Stress generally has a negative effect on cognitive functioning, such as working memory (Mizoguchi et al., 2000; Morgan, Doran, Steffian, Hazlett, & Southwick, 2006), short-term memory (Kuhlmann, Piel, & Wolf, 2005; Schwabe, Bohringer, & Wolf, 2009), and executive function (Holmes & Wellman, 2009). Yet, at other times, stress and its mediators appears to improve functioning (Yuen et al., 2009; Het, Ramlow, & Wolf, 2005). Several explanations exist for this inconsistency and they fit some but not all the reported relationships.

First, demand may have a curvilinear (i.e., inverted-U shape) relationship with its outcomes, such that low and high levels of demand are related to poor performance and intermediate levels to strong performance. Although this relationship has been observed in some domains of stress (e.g., adversity and well-being [Seery, Holman, & Silver, 2010]; learning [Salehi, Cordero, & Sandi, 2010]), the relationship is less ubiquitous and robust than some researchers believe (Westman & Eden, 1996) and relevant research is frequently misrepresented and miscited (Teigen, 1994).

Second, the time course of the stressor may be important, such that acute stressors benefit and chronic stressors impair memory processes (McEwen, 2007; Yuen et al.,

2009). However, not all acute stressors improve cognitive functioning, as those that are acutely negative can impair functioning (e.g., Arnsten & Goldman-Rakic, 1998; Holmes & Wellman, 2009; Schoofs, Preuss & Wolf, 2008; Kuhlmann et al., 2005; Morgan et al., 2006; Taverniers, van Ruysseveldt, Smeets, & von Grumbkow, 2010; Yang et al., 2003). Existing explanations for this process contribute to the solution but are not sufficient.

In addition to these processes, the ambiguity of stress's relationship with its cognitive outcomes may be explained by the two valences of stress having distinguishable effects on their outcome. Evidence from three related constructs supports this perspective. First, correlational evidence on challenge and hindrance stress in organizations indicates widely divergent relationships. Challenge stress relates positively and hindrance stress negatively to motivation (LePine, LePine, & Jackson, 2004; LePine et al., 2005), creativity (Ohly & Fritz, 2010), as well as school and work performance (LePine et al., 2004; LePine et al., 2005).

Second, experimental evidence from the biopsychosocial model indicates that challenge and threat appraisal have different cardiovascular outcomes. For example, although both appraisals increase heart rate, threat appraisal also increases blood pressure and challenge appraisal does not (Blascovich, 2008). Lastly, changing appraisal of the nature of the demand itself can also change demand's effect on cognitive functioning. Framing anxiety as effective can improve GRE performance (Jamieson, Mendes, Blackstock, Schmader, 2010) and framing task difficulty as indicative of learning rather than personal limitation improves working memory (Autin & Croizet, 2012). As such, the

appraisal of demand, and its relationship to available resources, may influence the relationship between demand and its outcomes.

If positively-valenced and negatively-valenced demands have different functions, then they may exert different effects on their outcomes, in line with those functions (Kruse & Sweeny, 2013). The management of positively-valenced and negatively-valenced demand (i.e., eustress and distress) serves related but different functions, as one is focused on the acquisition of resources and the other on the protection of them. In other words, eustress should help individuals engage a demand, whereas distress helps individuals survive it. In many cases, then, eustress should improve cognitive functioning because resources are being directed towards approaching and mastering the demand. On the other hand, distress should appear to impair many general cognitive functions, as resources are directed to essential survival processes (Arnsten, 2000; Arnsten & Goldman-Rakic, 1998). This model does not mean that distress is dysfunctional; rather, distress directs resources towards physical survival, is functional in those cases, and impairs functioning in others. Subsequently, processes dependent on these cognitive processes, such as problem solving, should then be appropriately improved or impaired (e.g., Holmes & Wellman, 2009). As such, situations indicative of eustress, such as when demand and secondary appraisal are both high, should relate to higher problem-solving performance, whereas those indicative of distress, such as demand and low secondary appraisal, should relate to lower problem-solving performance, compared to a state of non-demand. Accordingly, my hypotheses are:

H2: Secondary appraisal moderates the effect of demand on problem solving.

H2a: When secondary appraisal is high, demand improves problem solving.

H2b: When secondary appraisal is low, demand impairs problem solving.

Present Studies

In these studies, I examine the relationship between perceived demand and secondary appraisal on two outcomes: valence appraisal of a problem-solving task and performance on the task (Appendix 1). In both experiments, I experimentally manipulate demand by framing the apparent difficulty of the task. The studies differ in the treatment of secondary appraisal and in the nature of the problem-solving task. Secondary appraisal is measured without manipulation in Study 1 and manipulated with a pretest and feedback in Study 2. In turn, problem solving is assessed with a creativity-based Remote Associates Test (Mednick & Mednick, 1967) in Study 1 and with an arithmetic task in Study 2.

Study 1a: Valence Appraisal

Study 1a addressed whether secondary appraisal moderated the perceived valence of a demand and whether this in turn related to problem-solving performance. Addressing H1, when secondary appraisal is high, a demand should be perceived as positively-valenced, and, when secondary appraisal is low, it should be perceived as negatively-valenced.

Methods

Participants. One hundred and fifteen U.S. adults (78 females; 67.83%) were recruited through Amazon's mechanical Turk (mTurk; Buhrmester, Kwang, & Gosling 2011) to complete the study online. The mean age was 35.46 ($SD = 11.93$); see Table 1

for ethnicity and education demographics. Five participants (4.34%) indicated they were distracted during the study (i.e., responded affirmatively to the question, “Were you distracted during this study?”) and were excluded from subsequent analysis ($n = 110$).

Measures.

Primary appraisal / secondary appraisal (PASA). To assess primary and secondary appraisals prior to the cognitive task, participants completed the PASA (Gaab, Rohleder, Nater, & Ehlert, 2005; Appendix 7). The PASA consists of 16 items that in turn comprise two 8-item subscales for primary ($\alpha = .71$; e.g., “I do not feel threatened by the task,” reverse-coded) and secondary appraisal ($\alpha = .77$; e.g., “In this task I will probably be able to think of solutions”), respectively. Items were rated on a scale of 1 (*strongly disagree*) to 6 (*strongly agree*).

Perceived demand manipulation check. Participants completed a brief 3-item measure to assess how demanding they perceived the impending task (Appendix 5). Participants rated, on a scale of 1 (*strongly disagree*) to 6 (*strongly agree*), how “demanding,” “tough,” and “hard” they believed the task would be ($\alpha = .95$).

Affect. Participants completed the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988; Appendix 12). This measure consists of 20 affective items that comprise two 10-item subscales: positive ($\alpha = .90$; e.g., “interested,” “strong”) and negative ($\alpha = .91$; e.g., “guilty,” “upset”). Participants rated how they felt at that moment on a scale of 1 (*not at all*) to 5 (*very much*).

Valence appraisal. Participants completed an eight-item valence appraisal task. As no valence appraisal measure existed previously, I generated one in two steps. First,

thirty adults were recruited online to recount a time that was demanding in a positive way and one that was demanding in a negative way. Participants also described the experiences using short phrases and words. From this list, I selected four items for valence of demand that reflected prior theoretical descriptions of the two factors (Selye, 1974; Lazarus & Folkman, 1984): “worthwhile,” “valuable,” “paid off in the end,” and “gainful” for positively-valenced demand ($\alpha = .92$), and “threatening,” “distressing,” “displeasing,” and “troubling” for negatively-valenced demand ($\alpha = .96$; see Appendix 8 for instructions). In this and subsequent studies, participants responded to the items on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*).

Procedure. See Appendix 1 for study timeline. I asked participants to find a relatively quiet area and to shut off electronic distractions (e.g., televisions, music) prior to starting the study (Appendix 2). Participants read the description and instructions for the Remote Associates Test (Appendix 3) and then provided their prospective primary and secondary appraisals of the task on the PASA (Appendix 7). I framed the task by informing participants in the experimental condition that they had been assigned to the “difficult” condition; participants in the control condition did not receive a frame (Appendix 4). Participants then completed the prospective demand manipulation check (Appendix 5) and then their valence appraisal of the task (Appendix 8); they did not complete the actual task. Lastly, participants completed the PANAS (Appendix 12) and reported their demographics.

Results

Manipulation check. The manipulation was successful, as participants in the demand-frame condition reported greater perceived demand ($M = 5.00$, $SD = 0.99$) than those in control ($M = 3.92$, $SD = 1.18$), $t(102) = 5.10$, $p < .001$.

Hypothesis testing. See Table 2 for the correlations of all measures. To assess H1, I first standardized the two appraisal scores, effect-coded the conditions (control condition as reference group), and then generated an interaction term from their product. Controlling for primary appraisal, negative task valence, and both affects, a marginal main effect on positive task valence emerged for secondary appraisal, $\beta = 0.17$, $SE = 0.09$, $p = 0.073$, but not for demand condition, $\beta = 0.06$, $SE = 0.08$, $p = .454$; these effects were moderated by the hypothesized interaction, $\beta = 0.24$, $SE = 0.08$, $p = .005$ (Table 3, Model 2). A similar pattern occurred both when not controlling for affect (Table 3, Model 2) or any covariates (Table 3, Model 1; Figure 2).

Negative task valence demonstrated a slightly different set of relationships, such that a main effect of condition was observed, $\beta = 0.13$, $SE = 0.05$, $p = .020$, but none for secondary appraisal, $\beta = -0.08$, $SE = 0.07$, $p = .216$, and these were moderated by an interaction, $\beta = -0.12$, $SE = 0.06$, $p = .036$. A similar pattern occurred when not controlling for affect (Table 4, Model 2) or any covariates (Table 4, Model 1; Figure 3), except that the interaction was not significant in Model 2.

To further explore the hypotheses, I conducted a simple slopes analysis on Model 3 for each valence. Model 3 was chosen because it controlled for both affect and the opposite task valence and, for hypotheses relevant to valence, should therefore be the most conservative. Per H1a, when secondary appraisal is high, demand increases positive

task valence, compared to control, $\beta = 0.60$, $SE = 0.22$, $p = .009$, and does not significantly influence negative task valence, $\beta = -0.36$, $SE = 0.22$, $p = .136$. Per H1b, when secondary appraisal is low, demand increases negative task valence, compared to control, $\beta = 0.50$, $SE = 0.16$, $p = .002$, and does not significantly influence positive task valence, $\beta = 0.01$, $SE = 0.16$, $p = .958$.

Affect as alternative explanation. Although positive and negative task valence correlated highly with both positive and negative affect (Table 2), neither positive nor negative affect demonstrated the hypothesized interaction ($.581 > ps > .341$). Furthermore, parallel analysis on all 28 items of the valence appraisal and PANAS measures indicated 4 separate factors (Hayton, Allen, & Scarpello, 2004). Minimum residual factor analysis with oblimin rotation replicated the integrity of the four subscales.

Discussion

Study 1a provided evidence that secondary appraisal moderates demand such that, when secondary appraisal is high, demand increases positive task valence, and, when secondary appraisal is low, demand increases negative task valence. Furthermore, although affect and task valence were strongly related, at least three points indicate that the two constructs are theoretically distinguishable. First, affect did not behave in the same way as task valence and in particular did not respond to the interaction between conditions. Second, affect and task valence were distinguishable in a factor analysis of the measures. Third, including affect in the theoretical model did not change the pattern of relationships; as such, affect likely does not mediate the observed relationship. These

results provide support for half of the proposed model (H1a and H1b). As discussed previously, Study 1b continued the two-experiment approach by next addressing the relationship between demand and secondary appraisal on problem solving.

Study 1b: Performance on Remote Associates Test

Study 1b addressed whether secondary appraisal moderated the effect of demand on a creativity-based measure of cognitive performance. In particular, per H2, I sought to test whether demand increases creativity-based cognitive performance when secondary appraisal is high and impairs it when secondary appraisal is low.

Methods

Participants. As in Study 1a, 177 U.S. adults (105 females; 59%) were recruited through mTurk to complete the study online. The mean age was 34.33 ($SD = 11.88$); see Table 1 for ethnicity and education demographics. Of these participants, 31 (17.5%) reported being distracted during the study and were not included in analysis ($n = 146$).

Measures. In addition to the PASA, demand manipulation check, and PANAS, as in Study 1a, participants also completed the Remote Associates Test (RAT; Mednick & Mednick, 1967). The RAT is a cognitive measure of creativity (Mednick & Mednick, 1967) and insight (Bowers, Regehr, Balthazard, & Parker, 1990). Each problem consists of three disparate words (e.g., “Envy, Golf, Beans”; Appendix 9) and each solution is a single word that conceptually relates to all three words (e.g., “Green”). Problems did not actually differ by condition; all participants were presented with the same 15 randomly-ordered, medium-difficulty problems, previously normed by Shames (1994), and were

given three minutes to complete as many as they could. Time was restricted to control for differences in willingness to persevere at the task.

Procedure. See Appendix 1 for study timeline. The procedure was the same as in Study 1a, except that participants solved RAT problems in place of reporting their valence appraisal.

Results

Manipulation check. The manipulation was successful, as participants in the demand-frame condition reported greater perceived demand ($M = 5.11$, $SD = 0.83$) than those in control ($M = 4.00$, $SD = 1.09$), $t(144) = 6.73$, $p < .001$.

Hypothesis testing. See Table 5 for the correlations of all measures. To assess H2, I first standardized all continuous variables, effect-coded the conditions (with neutral control as reference group), and then generated an interaction term from their product. Controlling for number of problems attempted, primary appraisal, and both positive and negative affect (Table 6, Model 3), secondary appraisal had a marginal main effect, $\beta = 0.12$, $SE = 0.07$, $p = .086$, experimental condition did not, $\beta = -0.00$, $SE = 0.06$, $p = .953$, and these were moderated by a significant interaction, $\beta = 0.19$, $SE = 0.06$, $p = .004$. The same pattern occurred when not controlling for affect (Table 6, Model 2) or for any covariates (except number of problems attempted; Table 6, Model 1; Figure 4). One outlier existed in the experimental condition with a standardized secondary appraisal score below -3, but its exclusion did not change the significance of the hypothesized interaction.

To further explore the hypotheses, I conducted a simple slopes analysis on Model 3. Per H2a, when secondary appraisal is high, demand increased RAT performance, compared to control, $\beta = 0.18$, $SE = 0.09$, $p = .045$. Per H2b, when secondary appraisal is low, demand decreased RAT performance, compared to control, $\beta = -.19$, $SE = 0.09$, $p = .039$. The same pattern occurred, even when not including affect or primary appraisal.

Alternative explanations. Additional models were analyzed to test alternative explanations. First, addressing whether the interaction existed for any stress-relevant cognitive appraisal, and not just secondary appraisal, none of the preceding models yielded a significant interaction when primary appraisal was included as the key moderator ($.761 < ps < .985$). Second, addressing potential changes in motivation, the number of problems attempted (rather than number correct) did not differ by condition, nor was there an interaction (Table 7). Lastly, relevant to whether the present results are accounted for by changes in affect, no interactions existed between the conditions on positive or negative affect ($.241 < ps < .817$).

Discussion

Study 1b provides evidence that prospective secondary appraisal moderates the effect of demand on creativity-based problem-solving performance. In particular, these results indicate that, when secondary appraisal is low, demand impairs performance, and when secondary appraisal is high, demand improves performance, compared to a neutral control. These results are contrary to the perspective that secondary appraisal, which includes aspects of control and ability to cope with the demand, merely buffers against the negative consequences of demand.

I did not find evidence for three other alternative explanations. Although negative affect was a significant, negative predictor of performance, affect did not influence the hypothesized interaction and this absence suggests that affect does not mediate the present findings. Additionally, only secondary appraisal, not primary appraisal, moderated the effect of demand. Primary appraisal did not interact with experimental condition (Tables 6 and 7), so the interaction does not generalize to any prospective appraisal. Lastly, these results are not easily explained by differences in motivation to try harder or to persevere, as the number of problems attempted was controlled as a covariate and all participants received the same amount of time to complete the task. As such, the results suggest that differences in problem-solving performance are due to changes in ability to solve problems, rather than desire to solve problems.

Study 2: Experimentally Increasing Secondary Appraisal

In Study 2, I sought to extend Studies 1a and 1b in four ways. First, both the demand and no-demand conditions included frames. Second, secondary appraisal was experimentally manipulated rather than measured. Third, a different problem-solving task, arithmetic, was used in place of RAT. Lastly, both valence appraisal and problem solving were included as dependent variables. However, secondary appraisal was not experimentally reduced; Study 2 only addressed positively-valenced demand (H1a & H2a).

Methods

Participants. Similar to Study 1, 146 U.S. adults (89 females; 61%) were recruited through mTurk to complete the study online. The mean age was 32.40 ($SD =$

11.34); see Table 1 for ethnicity and education demographics. Of these participants, 21 either indicated in the demographics section that they had been distracted during the study or failed to correctly respond to a distraction probe (“If you are reading this, mark 'slightly disagree'”) and were not included in analysis ($n = 125$).

Measures. Participants completed a similar set of measures as in Study 1, including the demand manipulation check ($\alpha = .90$), PASA (primary $\alpha = .64$; secondary $\alpha = .75$), valence appraisal measure (positive $\alpha = .93$; negative $\alpha = .93$), and PANAS (positive affect $\alpha = .89$; negative affect $\alpha = .90$). In addition to these measures, participants completed a math pretest, math task, and an additional secondary appraisal manipulation check.

Math pretest. Participants completed a 20-item pretest (see Appendix 10) to both provide a rationale for the experimental feedback and to control for prior mathematical ability. Ten questions were single-digit (e.g., “2+7”) and ten were double-digit (e.g., “52+39”). As in Study 1, problem order was randomized. Time was not restricted ($M = 104.51$ seconds, $SD = 36.49$).

Secondary appraisal manipulation check. In addition to the PASA, participants completed a three item measure of manageability (i.e., “manageable,” “achievable,” and “impossible” [reverse-coded]; $\alpha = .77$) as a manipulation check for secondary appraisal (Appendix 6).

Math task. The primary problem-solving measure was a 100-item arithmetic task that consisted of 50 single-digit (e.g., “3+6”) and 50 double-digit (e.g., “79+66”)

problems (Appendix 11). As in Study 1, item order was randomized and time was restricted to three minutes to control for differences in motivation to persevere.

Procedures. See Appendix 1 for study timeline. First, participants completed the pretest (Appendices 3 and 10). Participants then read a description of the main task, were informed that the difficulty of the upcoming task would be “90%” (perceived demand condition; Appendix 4) or “10%” (no-demand control condition), and completed the demand manipulation check. Participants were then informed that their likelihood of success was either “100%” (high secondary appraisal condition) or “50%” (control). Participants then responded to the manageability appraisal measure (Appendix 6) and the PASA (Appendix 7). Participants completed the main math task. Lastly, participants completed the PANAS and reported their demographics.

Results

Manipulation checks. See Table 8 for correlations of all measures. The three manipulation checks were successful. Participants in the “90% difficulty” condition reported greater perceived demand ($M = 4.66, SD = 0.92$) than those in the “10% difficulty” condition ($M = 3.8, SD = 1.22$), $F(1, 121) = 19.52, p < .001$. Perceived demand did not differ by either feedback condition, $F(1, 121) = 0.50, p = .481$, nor did the conditions interact, $F(1, 121) = 0.04, p = .850$. See Table 9 for the same results as effect-coded regression.

Participants in the “100% likelihood” condition reported greater secondary appraisal on the PASA ($M = 4.46, SD = 0.64$) than those in the “50% likelihood” condition ($M = 4.12, SD = 0.75$), $F(1, 121) = 7.58, p = .007$. Secondary appraisal did not

differ by demand, $F(1, 121) = 0.37, p = .850$, nor did the conditions interact, $F(1, 121) = 2.35, p = .128$. Participants similarly differed on the manageability appraisal measure (experimental $M = 4.82, SD = .97$; control $M = 4.18, SD = .95$), $F(1, 121) = 14.01, p < .001$, with no main effect of perceived demand, $F(1, 121) = 0.37, p = .546$, or interaction, $F(1, 121) = 1.43, p = .233$.

Valence appraisal. To maintain consistency with Studies 1a and 1b, the hypothesized effects in Study 2 were analyzed using effect-coded regressions. All continuous variables were standardized prior to inclusion. Controlling for primary appraisal and negative task valence, a marginal main effect existed for feedback condition, $\beta = 0.15, SE = .08, p = 0.067$, but not for demand condition, $\beta = 0.06, SE = 0.08, p = .432$, on positive task valence and these results were in turn moderated by a significant interaction, $\beta = 0.17, SE = 0.08, p = .029$ (H1a; Table 10, Model 2). The same pattern occurred when also controlling for positive and negative affect (Table 10, Model 3) and a similar one materialized when not controlling for any covariates (Table 10, Model 1; Figure 5). Furthermore, negative task valence demonstrated a similar pattern, with the exception of a non-significant interaction (Table 11).

Simple slopes analyses revealed that participants in the positive-feedback / demand-frame condition perceived the task as more positively-valenced than those in the positive-feedback / no-demand-frame condition, $\beta = 0.24, SE = 0.11, p = .037$, the neutral-feedback / demand-frame condition, $\beta = 0.34, SE = .12, p = .004$, and the neutral-feedback / no-demand-frame condition, $\beta = 0.22, SE = .11, p = .049$.

Problem-solving performance. Controlling for pretest performance (i.e., number of problems attempted and answered correctly), number of problems attempted on the main task, and primary appraisal, no main effect was found for either demand condition, $\beta = -0.01$, $SE = 0.01$, $p = .539$, or feedback condition, $\beta = 0.03$, $SE = 0.02$, $p = .107$, on number of correctly answered questions on the main task, although these results were moderated by an interaction, $\beta = 0.05$, $SE = 0.02$, $p = .005$ (H2b; Table 12, Model 2). The same pattern emerged when not controlling for primary appraisal (Table 12, Model 1; Figure 6) and when also controlling for affect (Model 3), except that feedback condition also had a marginal main effect in both of these models.

Simple slopes analysis of Model 2 revealed that participants in the positive-feedback / demand-frame condition answered more problems correctly than those in the positive-feedback / no-demand-frame, condition, $\beta = 0.04$, $SE = 0.01$, $p = .001$, the neutral-feedback / demand-frame condition, $\beta = 0.04$, $SE = 0.01$, $p = .001$, and the neutral-feedback / no-demand condition, $\beta = 0.03$, $SE = 0.01$, $p = .010$.

Alternative explanations. First, addressing whether participants in the experimental condition focused primarily on the single-digit questions: only the double-digit problems demonstrated the hypothesized interaction, $\beta = 0.08$, $SE = 0.03$, $p = .005$ (Model 2). The single-digit interaction coefficient was positive but not significant, $\beta = 0.01$, $SE = 0.01$, $p = .384$. Second, addressing whether participants in the experimental condition did better because they attempted fewer: conditions did not differ, nor did they interact, on number of problems attempted in any of the three models tested ($ps > .289$).

Discussion

Study 2 provides evidence that when an individual appraises a problem-solving task as both demanding and manageable, they will also appraise the task positively and succeed at it. As in Study 1b, the increase in performance is not accounted for by a shift in the number of problems attempted, providing further evidence that manageable demands increase ability to solve problems rather than just the motivation to solve problems. Furthermore, Study 2 provides evidence that the observed effect is not due either to pre-existing differences in baseline problem-solving ability or to a methodological artifact caused by the absence of a frame in the demand-control condition. Lastly, as in previous studies, the inclusion of affect did not change the results and so it likely does not account for the observed interaction.

General Discussion

Across three studies, I provide evidence that secondary appraisal moderates the relationships between demand and two of its related processes: demand valence and problem-solving performance. These studies included two different problem-solving tasks that spanned both analytical/incremental and creativity/insight-based problem solving (Bowden, Jung-Beeman, Fleck, & Jounios, 2005; Mednick & Mednick, 1967; Metcalfe & Wiebe, 1987) and two different methods of framing the presence and absence of demand (i.e., “difficult” vs. no frame; “90% difficult” vs. “10% difficult”). They assessed the relationship between secondary appraisal and demand both correlationally and experimentally. The participants were a relatively diverse sample that was broadly representative of the United States in age, ethnicity, and education. Finally, little evidence emerged for alternative relationships, including both affect as a mediator or primary

appraisal as a moderator. Notably, these results were not easily explained by differences in motivation: Time was constrained for all participants and no significant differences existed between groups in number of problems attempted.

Theoretical Implications

The role of positive valence in demand. The results provide evidence for a need to expand the current definitions employed in stress research. In particular, the construct of primary appraisal needs to more strongly include positive valence appraisal. In both Studies 1a and 2 of the present research, a strong relationship was found between primary appraisal and negative task valence, but almost none between primary appraisal and positive task valence (Tables 2 and 8). Had the correlation been negative, rather than near zero, then primary appraisal would have at least provided information about both valences, albeit incompletely. Rather, these results imply that positive demand valence does not play a role in primary appraisal as currently operationalized. Building on this point, these results also provide evidence that the two valences of demand should be treated independently of each other. Although a moderate correlation exists between the two, they are not interchangeable and research that address negatively-valenced demands do not necessarily provide insight into positively-valenced demands.

The role of threat in demand. These studies suggest that threat is not necessary to the experience of demand. In Study 1a, negative task valence only significantly related to perceived demand for those low in secondary appraisal. In Study 2, negative task valence did not differ between demand conditions; individuals who perceived they were about to engage in a difficult task did not necessarily perceive it as more negative.

Notably, these results do not contradict the transactional model because, in it, stress is defined as requiring both demand and threat. By implication, demand and threat are two separate processes.

However, if “stress” still requires threat, but demand does not, then an alternative construct that is analogous to stress but predicated on positive demand (not threat) is necessary. In other words, if stress is the product of demand and threat, then theory is currently unclear on what the product of demand and opportunity is. It may be theoretically more parsimonious to simply allow for the existence of positively-valenced stress that does not presume the presence of threat. However, these propositions are difficult to test because, given the current theoretical conflation between stress and distress (Dienstbier, 1989; Lazarus & Folkman, 1984), the observed relationships between the two might be artificially inflated.

Problem solving. These results provide tentative evidence that the positively valenced demand promotes cognitive function rather than impairs it. These results extend previous frameworks that address the functionality of stress, such as the acute/chronic distinction and proposed curvilinear relationship. Indeed, the valenced demand framework may elucidate the mediator of those explanations. For example, some acute stressors may be beneficial in part because they are perceived as more manageable, and therefore positively-valenced, than chronic ones. As a demand prolongs, the individual’s resources dwindle, the individual’s secondary appraisal reduces, and the task becomes distressful rather than eustressful.

Similarly, the curvilinear relationship may be the product of the two valences of demand interacting negatively one another. As demand increases, but remains within the realm of manageability, eustress increases and subsequently improves cognitive performance. Once demand exceeds individuals' ability to manage it, it begins to elicit distress and, progressively, diminish performance. When distress and eustress are treated as two ends of the same continuum, then, they should yield a curvilinear relationship.

However, this theoretical speculation is qualified by an important caveat: Valence and performance did not strongly correlate in these studies. This lack of relationship is particularly notable because both valence and performance responded similarly to demand and secondary appraisal. Given this pattern, a spurious relationship between valence and problem solving would at least have been expected, because both are a product of the experimental interaction (Rosenthal & Rosnow, 2008). Although this absence may be the result of methodological limitations, such as insufficient power or a flaw in the way task valence was measured, one theoretical explanation for this surprising result is that an important moderator exists in the relationship between task valence and problem solving, such that task valence is indicative of eustress in some cases and not in others.

Methodological and Practical Implications

These studies contribute to methods in stress research in at least two ways. First, a short, reliable measure of perceived demand was developed. This measure may be useful as both a manipulation check for future research, as it was used in these studies, but also may be useful in naturalistic studies of demand. For example, an experience-sampling

study may implement the brief measure to explore the relationship between demand and well-being. Similarly, a measure of task valence was constructed that may enable future research on valenced demands. One caveat to this usage is that this measure does not necessarily imply demand. Although the measure may be useful in exploring eustress and distress in studies that specifically examine demand, the measure in itself does not necessarily assess stress, but rather task valence.

Furthermore, these results extend the practical implications of related domains, such as challenge stress and hindrance stress (Cavanaugh et al., 2000). Although challenge stress is not necessarily equivalent to positively-valenced demands, these demands likely play an important role in challenge stress' functioning. These studies provide experimental insight into the potential mediators of challenge stress on real workplace outcomes. For example, challenge stress is positively related to both school and work performance (LePine et al., 2004; LePine et al., 2005), possibly in part due to better problem-solving ability. These results provide insight into potential interventions in the future and experimentally bolster support for the proposition that high demands in the workplace should not necessarily be avoided but rather that they be well-supported and made worthwhile (Cavanaugh et al., 2000).

Limitations

The present research has several limitations. First, the problem-solving tasks were not themselves without difficulty. The actual difficulty of the task may have confounded the observed relationships and problems that are more or less difficult. However, per the transactional model, it is difficult to define an objective change in difficulty as the

experience of demand is mediated by the individual's appraisal of it (Lazarus & Folkman, 1984).

Additionally, as all participants were paid for their participation, all of the demands in the study did in fact yield a reward. This shortcoming does not strongly confound the study results, however, because payment was not contingent on the management of the demand. Individuals were not compensated based on performance. However, this limitation may partially explain the weak relationship between task valence and problem-solving performance, as individuals who did not experience eustress may still have reported the task being "worthwhile."

Lastly, all studies were conducted with a sample of U. S. American adults. American culture may interact with demand in theoretically specific ways; for example, Americans may exhibit optimistic perceptions of demand (Lee & Seligman, 2007) and have culturally-specific expectations about resource allocation (Leung & Bond, 1984). Given these factors, U. S. Americans may exhibit a predisposition towards eustress. However, this limitation does not obviate the potential contributions of this research; rather it indicates a need for research on positively-valenced demands in other cultures.

Future Studies

The present research suggests several new avenues of research. First, investigators could explore the mediators of the observed effect. That this pattern was observed in both creativity/insight-based and analytical/incremental-based problem solving implies that demand exerts its influence on a factor common to both processes. One candidate for a cognitive mediator is working memory (Baddeley, 2003), as stress has been shown to

both impair and improve it (e.g., Schoofs et al., 2008; Yuen et al., 2009). Additionally, future studies could explore the biological mediators. If valenced demands elicit different cognitive outcomes, they may operate on related but distinguishable biological pathways (Kruse & Sweeny, 2013).

Second, situations may exist in which the relationship between valenced demand and its outcomes is reversed, such that eustress impairs performance and distress improves it. In particular, situations that are highly relevant to survival may be best suited to distress (Arnsten & Goldman-Rakic, 1998). Studies that clarify the situations in which eustress and distress help and harm would elucidate the function of valenced demand and bolster the evolutionary theory that underpins the theoretical framework.

Conclusion

Positively-valenced demands have been included in some form in previous theories of stress but have rarely been deeply explored. The multivalence extension tested in this paper does not supplant but supplements these existing models. In particular, my framework acknowledges that beneficial outcomes can be a source of demand and that these positive demands may have meaningful differences from threatening demands in both process and outcome. Future research can build on these theoretical differences and further explore so-called “positive stress.”

References

- Arnsten, A. F. (2009). Stress signalling pathways that impair prefrontal cortex structure and function. *Nature Reviews Neuroscience*, *10*, 410-422.
- Arnsten, A. F., & Goldman-Rakic, P. S. (1998). Noise stress impairs prefrontal cortical cognitive function in monkeys: Evidence for a hyperdopaminergic mechanism. *Archives of General Psychiatry*, *55*, 362.
- Autin, F., & Croizet, J. C. (2012). Improving working memory efficiency by reframing metacognitive interpretation of task difficulty. *Journal of Experimental Psychology: General*, *141*, 610-618.
- Baddeley, A. (2003). Working memory: Looking back and looking forward. *Nature Reviews Neuroscience*, *4*, 829-839.
- Barrett, L. F., & Bliss-Moreau, E. (2009). Affect as a psychological primitive. *Advances in Experimental Social Psychology*, *41*, 167-218.
- Berlyne, D. E. (1978). Curiosity and learning. *Motivation and Emotion*, *2*(2), 97-175.
- Blascovich, J. (2008). Challenge and threat appraisal. In A. Elliot (Ed.), *Handbook of Approach and Avoidance Motivation*. New York, NY, US: Psychology Press.
- Blascovich, J., & Mendes, W. B. (2000). Challenge and threat appraisals: The role of affective cues. In J. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition* (pp. 59-82). Paris: Cambridge University Press.
- Blascovich, J., & Tomaka, J. (1996). The biopsychosocial model of arousal regulation. *Advances in Experimental Social Psychology*, *28*, 1-51.
- Bowden, E. M., Jung-Beeman, M., Fleck, J., & Kounios, J. (2005). New approaches to

- demystifying insight. *Trends in Cognitive Sciences*, 9, 322-328.
- Bowers, K.S., Regehr, G., Balthazard, C.G., & Parker, K. (1990). Intuition in the context of discovery. *Cognitive Psychology*, 22, 72-110.
- Bryant, F. B. (1989). A four-factor model of perceived control: Avoiding, coping, obtaining, and savoring. *Journal of Personality*, 57(4), 773-797.
- Bryant, F. B., & Veroff, J. (2007). *Savoring: A new model of positive experience*. Mahwah, NJ: Lawrence Erlbaum.
- Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, 6(1), 3-5.
- Cavanaugh, M. A., Boswell, W. R., Roehling, M. V., & Boudreau, J. W. (2000). An empirical examination of self-reported work stress among US managers. *Journal of Applied Psychology*, 85(1), 65-74.
- Diener, E., & Fujita, F. (1995). Resources, personal strivings, and subjective well-being: A nomothetic and idiographic approach. *Journal of Personality and Social Psychology*, 68(5), 926-935.
- Dienstbier, R. (1989). Arousal and physiological toughness: Implications for mental and physical health. *Psychological Review*, 96(1), 84-100.
- Erez, A., & Isen, A. M. (2002). The influence of positive affect on the components of expectancy motivation. *Journal of Applied Psychology*, 87(6), 1055-1067.
- Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter

- outcomes. *Journal of Personality and Social Psychology*, 50(5), 992-1003.
- Folkman, S., & Lazarus, R. S. (1980). An analysis of coping in a middle-aged community sample. *Journal of Health and Social Behavior*, 21, 219-239.
- Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: Study of emotion and coping during three stages of a college examination. *Journal of Personality and Social Psychology*, 48, 150-170.
- Folkman, S., & Moskowitz, J. T. (2000). Positive affect and the other side of coping. *American Psychologist*, 55(6), 647-654.
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56, 218.
- Hayton, J. C., Allen, D. G., & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. *Organizational Research Methods*, 7, 191-205.
- Helgeson, V. S., Reynolds, K. A., & Tomich, P. L. (2006). A meta-analytic review of benefit finding and growth. *Journal of Consulting and Clinical Psychology*, 74, 797-816.
- Het, S., Ramlow, G., & Wolf, O. T. (2005). A meta-analytic review of the effects of acute cortisol administration on human memory. *Psychoneuroendocrinology*, 30(8), 771-784. e
- Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*, 44(3), 513-524.
- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of*

General Psychology, 6(4), 307-324.

Holmes, A., & Wellman, C. L. (2009). Stress-induced prefrontal reorganization and executive dysfunction in rodents. *Neuroscience & Biobehavioral Reviews*, 33, 773-783.

Gaab, J., Rohleder, N., Nater, U. M., & Ehlert, U. (2005). Psychological determinants of the cortisol stress response: The role of anticipatory cognitive appraisal. *Psychoneuroendocrinology*, 30(6), 599-610.

Jamieson, J. P., Mendes, W. B., Blackstock, E., & Schmader, T. (2010). Turning the knots in your stomach into bows: Reappraising arousal improves performance on the GRE. *Journal of Experimental Social Psychology*, 46(1), 208-212.

Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine*, 4, 1-39.

Knutson, B., Taylor, J., Kaufman, M., Peterson, R., & Glover, G. (2005). Distributed neural representation of expected value. *The Journal of Neuroscience*, 25, 4806-4812.

Kruse, E. T., & Sweeny, K. (2013). *Strive and thrive: Towards a theory of eustress*.
Manuscript submitted for publication.

Kuhlmann, S., Piel, M., & Wolf, O. T. (2005). Impaired memory retrieval after psychosocial stress in healthy young men. *Journal of Neuroscience*, 25(11), 2977-2982.

Langston, C. A. (1994). Capitalizing on and coping with daily-life events: Expressive

- responses to positive events. *Journal of Personality and Social Psychology*, 67, 1112-1125.
- Lazarus, R. S. (1993). From psychological stress to the emotions: A history of changing outlooks. *Annual Review of Psychology*, 44, 1-21.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Lazarus, R. S., Kanner, A., & Folkman, S. (1980). Emotions: A cognitive-phenomenological analysis. In R. Plutchik, and H. Kellerman (Eds.), *Theories of emotion* (pp. 189-217). New York: Academic Press.
- Lee, Y. T., & Seligman, M. E. (1997). Are Americans more optimistic than the Chinese? *Personality and Social Psychology Bulletin*, 23, 32-40.
- LePine, J. A., LePine, M. A., & Jackson, C. L. (2004). Challenge and hindrance stress: relationships with exhaustion, motivation to learn, and learning performance. *Journal of Applied Psychology*, 89(5), 883-891.
- LePine, J. A., Podsakoff, N. P., & LePine, M. A. (2005). A meta-analytic test of the challenge stressor-hindrance stressor framework: An explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal*, 48(5), 764-775.
- Leung, K., & Bond, M. H. (1984). The impact of cultural collectivism on reward allocation. *Journal of Personality and Social Psychology*, 47, 793-804.
- Lewin, K. (1935). *A dynamic theory of personality*. New York: McGraw-Hill.
- Loewenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin*, 116(1), 75-98.

- Marshall, G. N., Wortman, C. B., Kusulas, J. W., Hervig, L. K., & Vickers Jr, R. R. (1992). Distinguishing optimism from pessimism: Relations to fundamental dimensions of mood and personality. *Journal of Personality and Social Psychology*, *62*, 1067-1074.
- McEwen, B. S. (2007). Physiology and neurobiology of stress and adaptation: Central role of the brain. *Physiological Reviews*, *87*, 873-904.
- Mednick, S.A., & Mednick, M.T. (1967). Examiner's manual: Remote Associates Test. Boston: Houghton Mifflin.
- Merali, Z., McIntosh, J., Kent, P., Michaud, D., & Anisman, H. (1998). Aversive and appetitive events evoke the release of corticotropin-releasing hormone and bombesin-like peptides at the central nucleus of the amygdala. *Journal of Neuroscience*, *18*(12), 4758-4766.
- Merali, Z., Michaud, D., McIntosh, J., Kent, P., & Anisman, H. (2003). Differential involvement of amygdaloid CRH system(s) in the salience and valence of the stimuli. *Progress in Neuro-psychopharmacology and Biological Psychiatry*, *27*(8), 1201-1212.
- Metcalf, J., & Wiebe, D. (1987). Intuition in insight and noninsight problem solving. *Memory & Cognition*, *15*(3), 238-246.
- Mizoguchi, K., Yuzurihara, M., Ishige, A., Sasaki, H., Chui, D. H., & Tabira, T. (2000). Chronic stress induces impairment of spatial working memory because of prefrontal dopaminergic dysfunction. *Journal of Neuroscience*, *20*(4), 1568-74.
- Morgan, C. A., Doran, A., Steffian, G., Hazlett, G., & Southwick, S. M. (2006). Stress-

- induced deficits in working memory and visuo-constructive abilities in Special Operations soldiers. *Biological Psychiatry*, 60(7), 722-729.
- Ohly, S., & Fritz, C. (2010). Work characteristics, challenge appraisal, creativity, and proactive behavior: A multi-level study. *Journal of Organizational Behavior*, 565, 543-565.
- Podsakoff, N. P., LePine, J. A., & LePine, M. A. (2007). Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: a meta-analysis. *Journal of Applied Psychology*, 92(2), 438-454.
- Rosenthal, R., & Rosnow, R. (2008). *Essentials of behavioral research: Methods and data analysis*. New York: McGraw-Hill.
- Salehi, B., Cordero, M. I., & Sandi, C. (2010). Learning under stress: The inverted-U-shape function revisited. *Learning & Memory*, 17, 522-530.
- Schoofs, D., Preuss, D., & Wolf, O. T. (2008). Psychosocial stress induces working memory impairments in an n-back paradigm. *Psychoneuroendocrinology*, 33(5), 643-653.
- Schwabe, L., Böhringer, A., & Wolf, O. T. (2009). Stress disrupts context-dependent memory. *Learning & Memory*, 16(2), 110-113.
- Seery, M. D., Holman, E. A., & Silver, R. C. (2010). Whatever does not kill us: Cumulative lifetime adversity, vulnerability, and resilience. *Journal of Personality and Social Psychology*, 99(6), 1025-1041.
- Seery, M. D., Weisbuch, M., & Blascovich, J. (2009). Something to gain, something to

- lose: The cardiovascular consequences of outcome framing. *International Journal of Psychophysiology*, 73(3), 308-312.
- Selye, H. (1974). *Stress without Distress*. Philadelphia, PA: Lippincott.
- Shames, V. A. (1994). *Is there such a thing as implicit problem-solving?* (Unpublished doctoral dissertation). University of Arizona, Arizona.
- Teigen, K. H. (1994). Yerkes-Dodson: A law for all seasons. *Theory & Psychology*, 4, 525-547.
- Tracy, J. L., Robins, R. W., & Tangney, J. P. (Eds.). (2007). *The self-conscious emotions: Theory and research*. New York: Guilford Press.
- Taverniers, J., Van Ruysseveldt, J., Smeets, T., & von Grumbkow, J. (2010). High-intensity stress elicits robust cortisol increases, and impairs working memory and visuo-spatial declarative memory in Special Forces candidates: A field experiment. *Stress*, 13(4), 323-333.
- Yang, Y., Cao, J., Xiong, W., Zhang, J., Zhou, Q., Wei, H., ... & Xu, L. (2003). Both stress experience and age determine the impairment or enhancement effect of stress on spatial memory retrieval. *Journal of Endocrinology*, 178(1), 45-54.
- Yuen, E. Y., Liu, W., Karatsoreos, I. N., Feng, J., McEwen, B. S., & Yan, Z. (2009). Acute stress enhances glutamatergic transmission in prefrontal cortex and facilitates working memory. *Proceedings of the National Academy of Sciences*, 106(33), 14075-14079.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of*

Personality and Social Psychology, 54(6), 1063-1070.

Westman, M., & Eden, D. (1996). The inverted-U relationship between stress and performance: A field study. *Work & Stress*, 10, 165-173.

Table 1.
Demographics by Study.

	Study 1a	Study 1b	Study 2
Ethnicity			
American Indian / Native Alaskan	2 (1.13%)	3 (2.61%)	1 (0.68%)
Asian	6 (3.39%)	12 (10.43%)	8 (5.48%)
Black / African-American	18 (10.17%)	7 (6.09%)	10 (6.85%)
Hispanic / Latino	4 (2.26%)	10 (8.70%)	13 (8.90%)
White	142 (80.23%)	80 (69.53%)	106 (72.60%)
Other	1 (0.56%)	0 (0%)	3 (2.05%)
More than one	4 (2.26%)	3 (2.61%)	5 (3.42%)
Education			
Some high school	1 (0.56%)	0 (0%)	3 (2.05%)
High school or equivalent	20 (11.30%)	6 (5.22%)	20 (13.70%)
Some college (inc. community college)	71 (40.11%)	46 (40%)	62 (42.47%)
Bachelor's degree	56 (31.64%)	43 (37.39%)	35 (23.97%)
Some graduate education	17 (9.60%)	10 (8.70%)	20 (13.70%)
Professional degree (law, medical)	10 (5.65%)	6 (5.22%)	5 (3.42%)
Ph.D.	0 (0%)	4 (3.48%)	1 (0.68%)

Note. Numbers in parentheses are percentage of study total.

Table 2.
Correlations between Measures in Study 1a

	1	2	3	4	5	6
1. Positive Task Valence						
2. Negative Task Valence	-.35					
3. Positive Affect	.50	-.24				
4. Negative Affect	-.19	.71	.05			
5. Demand	-.10	.46	-.14	.38		
6. PASA Primary Appraisal	-.12	.67	-.08	.53	.54	
7. PASA Secondary Appraisal	.35	-.46	.32	-.35	-.13	-.32

Note. Absolute correlations above .19 significant at $\alpha = .05$ (two-tailed). PASA = Primary Appraisal / Secondary Appraisal scale (Gaab et al., 2005).

Table 3.

Positive Valence as a Function of Condition and Secondary Appraisal in Study 1a

	Model 1			Model 2			Model 3		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Intercept)	0.00	0.09	.978	0.00	0.08	.981	0.00	0.08	0.980
Demand Condition	0.05	0.09	.554	0.10	0.09	.256	0.06	0.08	.454
Secondary Appraisal	0.36	0.09	.000	0.27	0.10	.005	0.17	0.09	.073
Demand x Secondary Appraisal	0.29	0.09	.001	0.25	0.09	.006	0.24	0.08	.005
Primary Appraisal	-	-	-	0.28	0.11	.015	0.22	0.11	.046
Negative Task Valence	-	-	-	-0.39	0.13	.002	-0.27	0.14	.055
Positive Affect	-	-	-	-	-	-	0.38	0.09	.000
Negative Affect	-	-	-	-	-	-	-0.04	0.11	.740
<i>F</i>	F(3, 106) = 8.48***			F(5, 104) = 7.54***			F(7, 102) = 9.01***		
ΔR^2_{adj} (R^2_{adj})	.17***			.06** (.23)			.11*** (.34)		

Note. Categorical variables were effect-coded (control = reference group) and continuous variables were standardized prior to inclusion. *F*-value for individual model. ΔR^2 significance compared to preceding model (i.e., Model 2 compared to Model 1). * $p > .05$; ** $p > .01$; *** $p > .001$

Table 4.

Negative Valence as a Function of Condition and Secondary Appraisal in Study 1a

	Model 1			Model 2			Model 3		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Intercept)	-0.00	0.08	.985	-0.00	0.06	.993	-0.00	0.05	0.985
Demand Condition	0.17	0.08	.041	0.14	0.06	.029	0.13	0.05	.020
Secondary Appraisal	-0.47	0.08	.000	-0.19	0.07	.008	-0.08	0.07	.216
Demand x Secondary Appraisal	-0.19	0.08	.024	-0.07	0.07	.294	-0.12	0.06	.036
Primary Appraisal	-	-	-	0.58	0.07	.000	0.40	0.07	.000
Positive Task Valence	-	-	-	-0.22	0.07	.002	-0.13	0.07	.055
Positive Affect	-	-	-	-	-	-	-0.14	0.06	.038
Negative Affect	-	-	-	-	-	-	0.42	0.07	.000
<i>F</i>	F(3, 106) = 12.98***			F(5, 104) = 29.82***			F(7, 102) = 34.47***		
ΔR^2_{adj} (R^2_{adj})	.25***			.27*** (.57)			.11*** (.68)		

Note. Categorical variables were effect-coded (control = reference group) and continuous variables were standardized prior to inclusion. *F*-value for individual model. ΔR^2 significance compared to preceding model (i.e., Model 2 compared to Model 1). * $p > .05$; ** $p > .01$; *** $p > .001$

Table 5.
Correlations between Measures in Study 1b

	1	2	3	4	5	6
1. RAT Problems Solved						
2. RAT Problems Attempted	.59					
3. Positive Affect	.19	.26				
4. Negative Affect	-.39	-.33	-.19			
5. Demand	.02	-.06	-.09	.20		
6. PASA Primary Appraisal	-.19	-.11	-.06	.31	.51	
7. PASA Secondary Appraisal	.10	-.04	.42	-.10	.05	-.09

Note. Absolute correlations above .16 significant at $\alpha = .05$ (two-tailed). RAT = Remote Associates Test (Mednick & Mednick, 1967). PASA = Primary Appraisal / Secondary Appraisal scale (Gaab et al., 2005).

Table 6.

Performance on Remote Associates Test as a Function of Experimental Condition and Secondary Appraisal in Study 1b

	Model 1			Model 2			Model 3		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Intercept)	-0.00	0.07	.981	-0.00	0.06	.994	-0.00	0.06	.981
Demand Condition	-0.00	0.07	.950	0.00	0.07	.955	-0.00	0.06	.951
Secondary Appraisal	0.12	0.07	.065	0.11	0.06	.090	0.12	0.07	.086
Demand x Secondary Appraisal	0.19	0.06	.003	0.19	0.06	.004	0.19	0.06	.004
Problems Attempted	0.60	0.07	.000	0.59	0.07	.000	0.56	0.07	.000
Primary Appraisal	-	-	-	-0.11	0.07	.108	-0.06	0.07	.393
Positive Affect	-	-	-	-	-	-	-0.06	0.07	.388
Negative Affect	-	-	-	-	-	-	-0.17	0.06	.016
<i>F</i>	F(4, 141) = 24.04***			F(5, 140) = 19.97***			F(7, 138) = 15.64***		
ΔR^2_{adj} (R^2_{adj})	.39***			.01 (.40)			.01* (.41)		

Note. Categorical variables were effect-coded (control = reference group) and continuous variables were standardized prior to inclusion. *F*-value for individual model. ΔR^2 significance compared to preceding model (i.e., Model 2 compared to Model 1). * $p > .05$; ** $p > .01$; *** $p > .001$

Table 7.

Number of Problems Attempted on Remote Associates Test as a Function of Experimental Condition and Secondary Appraisal in Study 1b

	Model 1			Model 2			Model 3		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Intercept)	0.01	0.08	.952	.01	0.08	.941	0.01	0.08	.928
Demand Condition	0.04	0.08	.668	0.04	0.08	.598	0.05	0.08	.534
Secondary Appraisal	-0.04	0.08	.638	-0.05	0.08	.550	-0.19	0.08	.024
Demand x Secondary Appraisal	-0.03	0.08	.751	-0.03	0.08	.723	-0.07	0.08	.398
Primary Appraisal	-	-	-	-0.12	0.08	.158	-0.02	0.08	.771
Positive Affect	-	-	-	-	-	-	0.29	0.09	.001
Negative Affect	-	-	-	-	-	-	-0.29	0.08	.001
<i>F</i>	F(3, 142) = 0.17			F(4, 141) = 0.63			F(6, 139) = 5.28***		
ΔR^2_{adj} (R^2_{adj})	.00			.00			*** (.15)		

Note. Categorical variables were effect-coded (control = reference group) and continuous variables were standardized prior to inclusion. *F*-value for individual model. ΔR^2 significance compared to preceding model (i.e., Model 2 compared to Model 1). * $p > .05$; ** $p > .01$; *** $p > .001$

Table 8.

Correlations between Measures in Study 2

	1	2	3	4	5	6	7	8
1. Math Problems Solved								
2. Math Problems Attempted	.99							
3. Positive Task Valence	.08	.07						
4. Negative Task Valence	-.28	-.27	-.36					
5. Positive Affect	.05	.05	.43	-.37				
6. Negative Affect	-.04	-.03	-.05	.40	-.07			
7. Demand	.01	-.00	-.03	.34	-.09	.14		
8. PASA Primary Appraisal	-.24	-.23	-.06	.72	-.06	.35	.40	
9. PASA Secondary Appraisal	.14	.12	.53	-.40	.38	-.15	-.18	-.26

Note. Absolute correlations above .17 significant at $\alpha = .05$ (two-tailed). PASA = Primary Appraisal / Secondary Appraisal scale (Gaab et al., 2005).

Table 9.

Manipulation Checks for Study 2

	Demand			PASA Secondary Appraisal			Manageability		
	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>	<i>B</i>	<i>SE</i>	<i>p</i>
Demand Condition	0.43	.097	.000	-.02	.087	.840	-.054	.086	.533
Feedback Condition	-0.07	.097	.475	.23	.087	.009	.32	.086	.000
Demand x Feedback	0.02	.097	.846	.13	.087	.128	.10	.086	.233

Note. Categorical variables were effect-coded (control = reference group) prior to inclusion. Bolded coefficients are successful manipulation checks.

Table 10.

Positive Valence as a Function of Experimental Condition in Study 2

	Model 1			Model 2			Model 3		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Intercept)	-0.00	0.09	.974	-0.00	.963	.000	-0.00	0.08	.961
Demand Condition	0.05	0.09	.550	0.06	0.08	.432	0.06	0.08	.413
Feedback Condition	0.20	0.09	.020	0.15	0.08	.067	0.15	0.08	.070
Demand x Feedback	0.20	0.09	.022	0.17	0.08	.029	0.17	0.08	.031
Primary Appraisal	-	-	-	0.43	0.11	.000	0.31	0.12	.008
Negative Task Valence	-	-	-	-0.61	0.11	.000	-0.47	0.13	.000
Positive Affect	-	-	-	-	-	-	0.26	0.09	.004
Negative Affect	-	-	-	-	-	-	0.09	0.09	.319
<i>F</i>	<i>F</i> (3,121) = 3.95*			<i>F</i> (5,119) = 8.63***			<i>F</i> (7, 117) = 8.09***		
ΔR^2_{adj} (R^2_{adj})	.07*			.17*** (.24)			.05** (.29)		

Note. Categorical variables were effect (control = reference group) and continuous variables were standardized prior to inclusion. *F*-value for individual model. ΔR^2 significance compared to preceding model (i.e., Model 2 compared to Model 1). * $p > .05$; ** $p > .01$; *** $p > .001$

Table 11.

Negative Valence as a Function of Experimental Condition in Study 2

	Model 1			Model 2			Model 3		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Intercept)	-0.00	0.09	.000	-0.00	0.06	.000	-0.00	0.05	.937
Demand Condition	0.03	0.09	.723	0.03	0.06	.561	0.07	0.05	.204
Feedback Condition	-0.31	0.09	.001	-0.02	0.06	.722	-0.02	0.06	.775
Demand x Feedback	-0.06	0.09	.520	0.02	0.06	.712	0.02	0.05	.705
Primary Appraisal	-	-	-	0.69	0.06	.000	0.62	0.06	.000
Positive Task Valence	-	-	-	-0.32	0.06	.000	-0.22	0.06	.000
Positive Affect	-	-	-	-	-	-	-0.22	0.06	.000
Negative Affect	-	-	-	-	-	-	0.17	0.06	.004
<i>F</i>	F(3, 121) = 4.47**			F(5, 119) = 37.98***			F(7, 117) = 35.65***		
ΔR^2_{adj} (R^2_{adj})	.08**			.52*** (.60)			.06*** (.66)		

Note. Categorical variables were effect-coded (control = reference group) and continuous variables were standardized prior to inclusion. ΔR^2 significance compared to preceding model (i.e., Model 2 compared to Model 1). * $p > .05$; ** $p > .01$; *** $p > .001$

Table 12.

Number of Problems Answered Correctly as a Function of Experimental Condition in Study 2

	Model 1			Model 2			Model 3		
	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>	β	<i>SE</i>	<i>p</i>
(Intercept)	-0.01	.01	.181	-0.01	.01	.205	-0.02	0.01	.188
Demand Condition	-.01	.01	.539	-0.01	.01	.539	-0.01	0.01	.555
Feedback Condition	.03	.02	.081	0.03	.02	.107	0.03	0.02	.095
Demand x Feedback	.05	.02	.005	0.05	.02	.005	0.05	0.02	.005
Problems Attempted	.98	.01	.000	0.98	.01	.000	0.98	0.01	.000
Pretest Problems Attempted	-.03	.01	.003	-0.03	.01	.003	-0.03	0.01	.005
Pretest Problems Correct	.05	.01	.000	0.05	.01	.000	0.05	0.01	.000
Primary Appraisal	-	-	-	-0.00	.01	.904	-0.00	0.01	.896
Positive Affect	-	-	-	-	-	-	-0.01	0.01	.480
Negative Affect	-	-	-	-	-	-	0.00	.01	.921
<i>F</i>	F(6, 118) = 2728***			F(7, 117) = 2319***			F(9, 115) = 1781***		
ΔR^2_{adj} (R^2_{adj})	.99 ***			.99 (.99)			.99(.99)		

Note. Categorical variables were effect-coded (control = reference group) and continuous variables were standardized prior to inclusion. ΔR^2 significance compared to preceding model (i.e., Model 2 compared to Model 1). * $p > .05$; ** $p > .01$; *** $p > .001$

		Valence		
		Positive	Neutral	Negative
Manageability	High	Eustress	Eustress	Distress
	Medium	Eustress	Unclear; Likely Determined by Disposition	Distress
	Low	Eustress	Distress	Distress

Figure 1. Theoretical predictions about valence of stress from Kruse & Sweeny (2013). Present research addresses role of manageability (i.e., secondary appraisal) on valence of demand, as presented in the middle column.

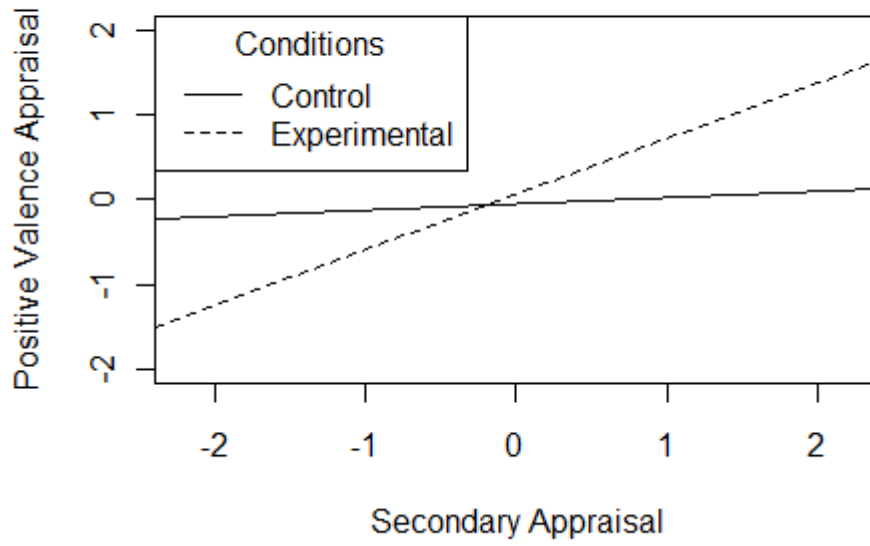


Figure 2. Positive valence appraisal as a function of secondary appraisal and experimental condition in Study 1a.

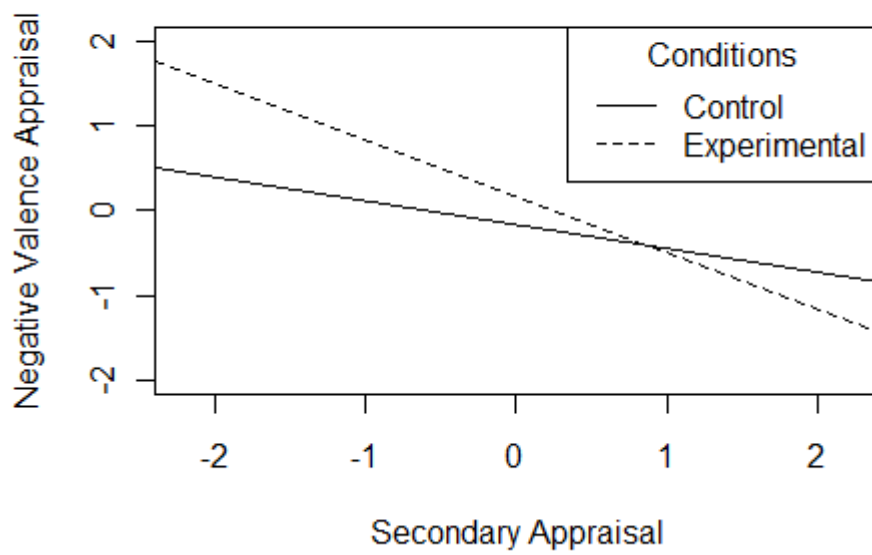


Figure 3. Negative valence appraisal as a function of secondary appraisal and demand condition in Study 1a.

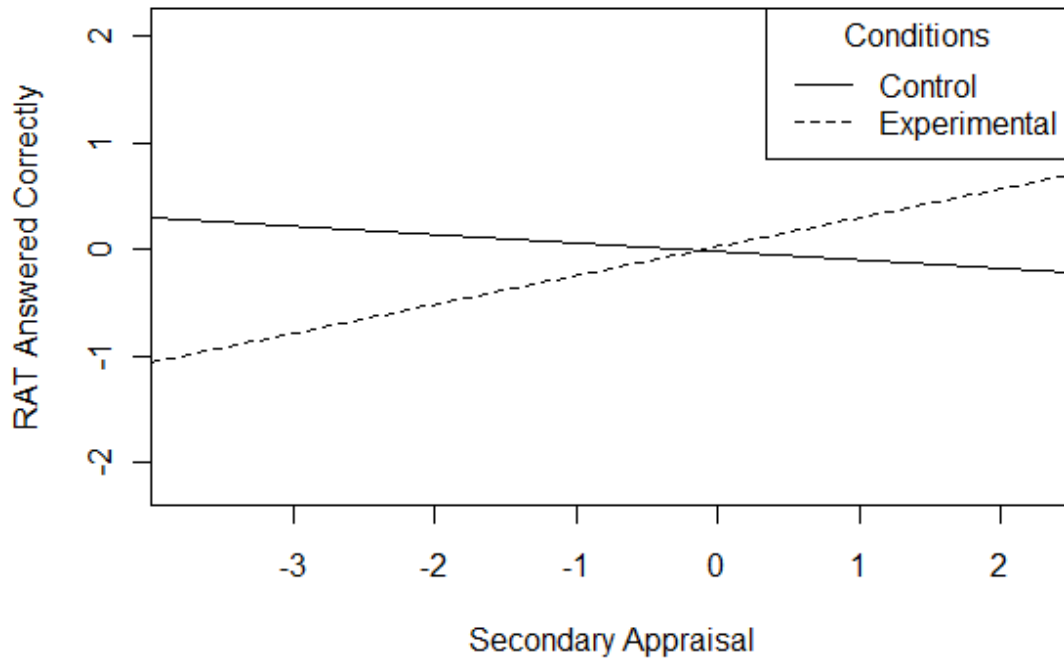


Figure 4. Number of RAT problems correctly solved in control and demand conditions as a function of secondary appraisal in Study 1b.

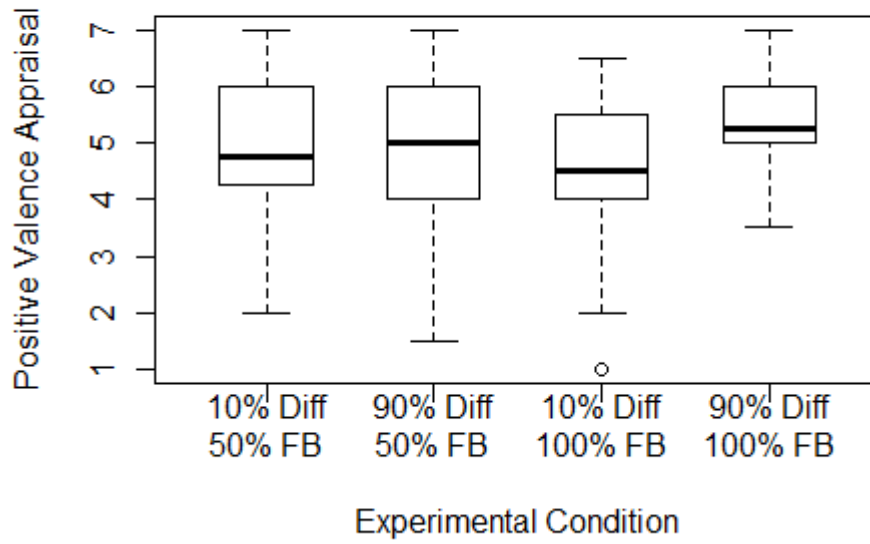


Figure 5. Positive valence appraisal by experimental condition in Study 2. “10% Diff” = Demand control condition; “90% Diff” = High perceived demand condition. “50% FB” = Secondary appraisal control condition; “100% FB” = High secondary appraisal condition.

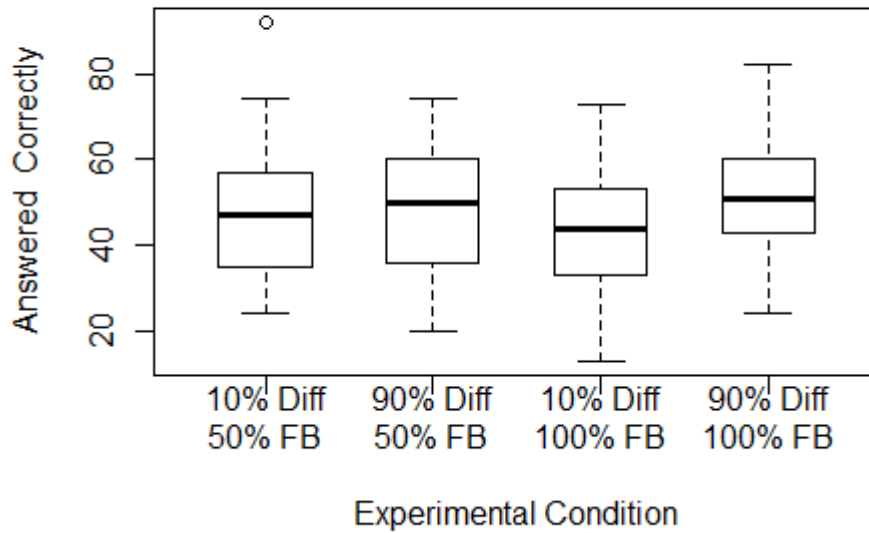


Figure 6. Problems answered correctly by experimental condition in Study 2. “10% Diff” = Demand control condition; “90% Diff” = High perceived demand condition. “50% FB” = Secondary appraisal control condition; “100% FB” = High secondary appraisal condition.

Appendix 1
Timeline for All Studies

1. Study 1a
 1. Initial instructions
 2. Task description and instructions
 3. PASA
 4. IV: Demand frame (“difficult” vs. no frame)
 5. Demand manipulation check
 6. DV: Valence appraisal
 7. PANAS
 8. Demographics
2. Study 1b
 1. Initial instructions
 2. Task description and instructions
 3. PASA
 4. IV: Demand frame (“difficult” vs. no frame)
 5. Demand manipulation check
 6. DV: RAT performance
 7. PANAS
 8. Demographics
3. Study 2
 1. Initial instructions
 2. Pretest instructions
 3. Pretest (20 arithmetic problems, 1 minute)
 4. Main task instructions
 5. IV: Perceived demand frame (task difficulty: 90% vs. 10%)
 6. Perceived demand manipulation check
 7. IV: False feedback (likelihood of success: 50% vs. 100%)
 8. PASA (manipulation check)
 9. Manageability appraisal (manipulation check)
 10. DV: Valence appraisal
 11. DV: Math performance
 12. PANAS
 13. Demographics

Appendix 2

Initial Instructions

Please find a relatively quiet area where you will not be disturbed for 10 minutes. Please turn off your music, television, skype/chat, and games. If you cannot find a spot where you can focus on the studies for 10 minutes, please wait until a later time when you can.

Appendix 3

Task Description and Instructions

STUDY 1 (REMOTE ASSOCIATES TEST)

In this task, you will be presented with questions that consist of three words each. The answer to each question is a fourth word that relates to all three. For example, you might be presented with "Falling Actor Dust" and the answer is "Star," because it relates to all three words. Another question might be "Gold Stool Tender" and the answer would be "Bar" for "Gold bar," "Bar stool," or "Bartender." Although these examples formed compound words, not all of them will. "Mouse" could be related to "cheese," for example. Try to answer these as quickly and correctly as you can. You will have exactly 3 minutes. DO NOT look up the answers in any way. This is to test how you can do them on your own.

STUDY 2 (PRETEST INSTRUCTIONS)

In this task, you will see 20 arithmetic problems. Try to answer these as quickly and correctly as you can. DO NOT use a calculator or a pencil. This is to test how you can do them on your own.

STUDY 2 (MAIN TASK INSTRUCTIONS)

In this task, you will see 100 arithmetic problems. Try to answer these as quickly and correctly as you can. You will have exactly 3 minutes. DO NOT use a calculator or a pencil. This is to test how you can do them on your own.

Appendix 4

Experimental Manipulations

STUDY 1a / 1b

Control: [no frame]

Demand: You have been assigned to answer questions at difficulty level: **Difficult**.

STUDY 2 (DEMAND FRAME):

Control: The next task's difficulty level is: **10%**

Experimental: The next task's difficulty level is: **90%**

STUDY 2 (SECONDARY APPRAISAL FRAME)

Control: Based on your previous performance, your likelihood of success is: **50%**

Experimental: Based on your previous performance, your likelihood of success is: **100%**

Appendix 5

Demand Manipulation Check

“Do you think the following task will be...”

[1 = strongly disagree; 6 = strongly agree]

1. Demanding
2. Hard
3. Tough

Appendix 6

Manageability Manipulation Check

“Please respond to the following with your thoughts about the upcoming task. Answer honestly; there is no right or wrong answer.” [1 = strongly disagree; 6 = strongly agree]

1. Manageable
2. Achievable
3. Impossible [reverse-coded]

Appendix 7

Primary Appraisal / Secondary Appraisal Measure

“Please respond to the following with your thoughts about the upcoming task. Answer honestly; there is no right or wrong answer.” [1 = strongly disagree; 6 = strongly agree]

1. I do not feel threatened by the task.
2. The task is important to me.
3. For this task I know what I can do.
4. It mainly depends on me whether the experts judge me positively.
5. I find this task very unpleasant.
6. I do not care about this task.
7. I have no idea what I should do now.
8. I can best protect myself against failure in this task through my behavior.
9. I do not feel worried because the task does not represent any threat for me.
10. The task is not a challenge for me.
11. In this task I will probably be able to think of solutions.
12. I am able to determine a great deal of what happens in this task myself.
13. This task scares me.
14. This task challenges me.
15. I can think of lots of solutions for solving this task.
16. If the experts judge me positively it will be a consequence of my effort and personal commitment.

Appendix 8
Valence Appraisal Measure

“How did you feel about the task? It will (be)...”

[1 = strongly disagree; 4 = neither agree nor disagree; 7 = strongly agree]

1. Worthwhile
2. Valuable
3. Will pay off
4. Gainful
5. Threatening
6. Distressing
7. Displeasing
8. Troubling

Appendix 9

Remote Associates Test

“Answer as many of the following questions as quickly and correctly as you can. You will be automatically moved to the next page in three minutes.” [Question order was randomized.]

1. Blade Witted Weary
2. Cherry Time Smell
3. Notch Flight Spin
4. Strap Pocket Time
5. Walker Main Sweeper
6. Wicked Bustle Slicker
7. Chocolate Fortune Tin
8. Color Numbers Oil
9. Mouse Sharp Blue
10. Sandwich Golf Foot
11. Silk Cream Even
12. Speak Money Street
13. Big Leaf Shade
14. Envy Golf Beans
15. Hall Car Swimming

Appendix 10

Arithmetic Pre-test

“Please answer the following arithmetic questions as quickly as possible. DO NOT use a calculator or a pencil.” [Question order was randomized.]

$5+1$

$4+2$

$6+2$

$3+4$

$2+7$

$1+3$

$7+5$

$8+6$

$9+3$

$6+7$

$15+47$

$23+88$

$38+57$

$33+82$

$44+67$

$52+39$

$65+51$

$72+84$

$89+12$

$94+44$

Appendix 11

Arithmetic Task

“Please answer the following arithmetic questions as quickly as possible. DO NOT use a calculator or a pencil.” [Question order was randomized.]

1+2	7+6	38+59	83+11
1+4	8+1	39+28	83+97
1+7	8+10	40+50	85+83
1+8	8+2	41+27	87+62
1+9	8+3	42+45	90+86
2+1	8+4	43+66	92+73
2+5	8+8	47+50	93+31
2+8	8+9	48+74	95+32
3+1	9+2	48+90	97+88
3+10	9+3	49+61	97+90
3+2	9+4	49+67	98+92
3+5	9+5	51+76	99+49
3+6	9+6	53+20	99+85
3+7	9+7	54+63	
3+8	9+8	55+60	
4+10	10+1	56+40	
4+5	10+2	59+44	
4+7	10+3	61+52	
4+9	10+6	64+50	
5+10	10+8	66+79	
5+4	10+9	68+38	
5+6	13+27	74+45	
5+8	18+65	76+64	
6+1	20+60	77+13	
6+6	24+38	79+66	
6+8	24+95	80+78	
7+2	28+87	80+98	
7+3	34+31	81+13	
7+5	34+89	82+69	

Appendix 12

Positive and Negative Affect Schedule (PANAS)

“How do you feel right now?”[1 = Not at all; 2 = A little; 3 = Moderately; 4 = Quite a bit;

5 = Very much; item order was randomized]

1. Interested
2. Alert
3. Attentive
4. Excited
5. Enthusiastic
6. Inspired
7. Proud
8. Determined
9. Strong
10. Active
11. Distressed
12. Upset
13. Guilty
14. Ashamed
15. Hostile
16. Irritable
17. Nervous
18. Jittery
19. Scared
20. Afraid