

FUNCTIONS OF ATTACHMENT IN EVERYDAY ADULT LIFE: AFFECT REGULATION,  
WORK, AND WELL-BEING

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# FUNCTIONS OF ATTACHMENT IN EVERYDAY ADULT LIFE: AFFECT REGULATION, WORK, AND WELL-BEING

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Three papers investigate the role of adult attachment relationships in affect regulation, quality of work experience, and physical and psychological well-being. The first paper examines the effect of activating mental representations of attachment figures (mother or romantic partner) on affective recovery following an upsetting autobiographical memory recall. Three experiments show that activating the mental representation of an attachment figure (vs. an acquaintance or a stranger) enhances recovery by reducing negative affect and negative thinking. Moreover, a meta-analysis of the three experiments revealed that avoidant attachment was associated with reduced recovery effects. Finally, the magnitude of affective recovery due to activating the romantic partner representation predicted psychological and physical health in daily life. Although these experimental findings indicate that romantic attachments lead to better affect regulation as well as mental and physical health, receiving support from a romantic partner in daily life has sometimes been linked to worse outcomes. The second paper investigates the circumstances under which received partner support is or is not harmful for physical health. Findings from a 10-year longitudinal study revealed that perceived partner responsiveness moderates the association between received partner support and all-cause mortality. For participants who perceived their partners as unresponsive, received partner support was indeed associated with an increase in all-cause mortality risk, even after controlling for demographic factors, initial health status, health behaviors, psychological well-being, and personality traits. However, this association was eliminated if the romantic partner was perceived as responsive.

Finally, the third paper investigates the association between perceived partner responsiveness and quality of work in two daily experience studies. Perceived partner responsiveness was associated with increased quality of daily work experience which, in turn, predicted greater daily goal progress among young adults and greater life satisfaction among middle-aged and older adults. Furthermore, daily stress exposure was associated with lower decline in quality of work for individuals who perceived their partners as responsive, indicating that perceived partner responsiveness buffers against the detrimental effects of daily stress on quality of work. Taken together, the three papers contribute to our growing understanding of the role of attachment relationships in adult functioning.

## BIOGRAPHICAL SKETCH

Emre Selcuk received his B.S. degree from the Department of Business Administration at Middle East Technical University, Ankara, Turkey in 2003. He worked as a Fulbright Visiting Researcher at the Department of Psychology, University of Kansas before joining the Department of Human Development at Cornell University to pursue graduate studies in 2008. He received his M.A. degree in 2010 and his Ph.D. degree in 2013 from Cornell University. His research focuses on the formation, maintenance, and functions of attachment relationships across the lifespan, and the individual difference factors (e.g., attachment style, relationship quality) moderating these processes. He has so far coauthored more than 15 publications including papers in peer-reviewed journals and chapters in edited books. His work has been continuously funded by several institutions including the Fulbright Program, the Council of Higher Education of Turkey, and Cornell University. He has recently received the Urie Bronfenbrenner Teaching Award from the Department of Human Development at Cornell University and a Best Paper Award from the Relationship Research Interest Group of the Society for Personality and Social Psychology for his research on adult attachment and affect regulation. Selcuk will join the Department of Psychology at Middle East Technical University, Ankara, Turkey as an assistant professor in Fall 2013.

Her güzelliđi ve zorluđu el ele, gönöl gönüle yaşıadıđım canım aşkım Gül Günaydın'a

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# CHAPTER 1

## Introduction

The tendency to form and maintain long-term social bonds is a characteristic feature of human life. Although observed to some extent in other primates (Dunbar & Shultz, 2007), the immense complexity of emotional and cognitive mechanisms underlying social bonds is almost unique to humans (Machin & Dunbar, 2011), and the implications of these bonds for psychological and physical well-being across the lifespan are nearly unmatched. Just about all imaginable aspects of one's life, from our ability to cope with stressors to success in achieving our goals, from how happy we feel to how frequently we get sick and even how long we live are substantially affected by the existence and quality of our close relationships (e.g., Ryff & Singer, 2001; Steptoe, Shankar, Demakakos, & Wardle, 2013).

Attachment theory (Bowlby, 1988) has been one of the most widely used theoretical frameworks to understand the nature, formation, and functions of close relationships. Although initially developed to explain the nature of infant-caregiver bonds (Bowlby, 1973, 1980, 1982), the theory has subsequently been extended to study human attachments across the lifespan, ranging from the first attachment relationship with caregivers in infancy to romantic bonds in adulthood (Bowlby, 1979; Hazan & Shaver, 1987). With its lifespan perspective on close relationships, incorporation of individual differences explaining the variation in normative relationship processes, and applicability to diverse human cultures, attachment theory provides unique insights into the study of close relationships from “the cradle to the grave.”

The basic tenet of attachment theory is that infants form a unique, irreplaceable relationship with one or a few individuals who provide care and protection. When distressed, infants preferentially seek these “attachment figures” for comfort. Upon repeated interactions,

infants learn that attachment figures will be available and responsive when needed. This sense of security, in turn, facilitates infants' exploratory behaviors aimed at investigating, learning, and mastering the social and physical environments; and in the long-term contributes to their autonomy, social development, and psychological well-being.

Although the type of attachment relationships, the nature of stressors encountered, and the contexts of exploration change as individuals mature, attachment relationships serve similar functions in adulthood as well (see Selcuk, Zayas, & Hazan, 2010 for a review). They help regulate negative affect induced by stressful events, and in turn, confer protective health benefits and promote psychological well-being. Perceived responsiveness of attachment figures also enhances exploration, as manifested, for instance, in individuals' engagement in daily work and ability to meet personal goals.

The present dissertation aims to contribute to our growing understanding of the functions of adult attachment relationships. Chapter 2 presents three experiments investigating the effect of activating mental representations of attachment figures on affective recovery following upsetting memory recall, a meta-analysis investigating whether individual differences in the quality of attachment moderate the recovery effects, and a longitudinal follow-up examining whether the magnitude of recovery effects observed in the laboratory predicts long-term physical and psychological health in daily life. Altogether these studies form the first systematic investigation of how mental representations of attachment figures influence our ability to regulate negative affect induced by recalling upsetting experiences. Chapter 3 further examines the health implications of adult attachments in a 10-year longitudinal study. This study presents one of the first pieces of evidence on the factors moderating the association between received support and health outcomes. Specifically, the findings show that the association between received support

from a romantic attachment figure and all-cause mortality depends on whether the romantic partner is perceived as responsive (vs. unresponsive) to one's needs. Chapter 4 shifts the focus to the implications for exploration. Two daily experience studies with young, middle-aged, and older adults investigate the association between perceived partner responsiveness and quality of work—the prototypical form of exploration in adults' daily life. These studies document the first evidence that perceived partner responsiveness is associated with better quality of daily work which, in turn, prospectively predicts goal progress and life satisfaction. Finally, Chapter 5 highlights directions for future research on adult attachment.<sup>1</sup>

Overall, using multiple methods including experiments, longitudinal follow-ups, and daily experience designs, the present studies provide a systematic investigation of how key

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<sup>1</sup> Chapter 2 was previously published in the *Journal of Personality and Social Psychology* (Copyright © 2012 by the American Psychological Association. Reproduced with permission. The official citation that should be used in referencing this material is Selcuk, E., Zayas, V., Günaydin, G., Hazan, C., & Kross, E. (2012). Mental representations of attachment figures facilitate recovery following upsetting autobiographical memory recall. *Journal of Personality and Social Psychology, 103*, 362-378. No further reproduction or distribution is permitted without written permission from the American Psychological Association). Chapter 3 was previously published in *Health Psychology* (Copyright © 2013 by the American Psychological Association. Reproduced with permission. The official citation that should be used in referencing this material is Selcuk, E., & Ong, A. D. (2013). Perceived partner responsiveness moderates the association between received emotional support and all-cause mortality. *Health Psychology, 32*, 231-235. No further reproduction or distribution is permitted without written permission from the American Psychological Association).

components of adult attachments, from mental representations to perceived responsiveness, affect diverse aspects of adult functioning including affect regulation, quality of daily work, psychological well-being, and physical health.

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## CHAPTER 2

### **Mental Representations of Attachment Figures Facilitate Recovery Following Upsetting Autobiographical Memory Recall**

It has long been assumed that relationships with available and responsive attachment figures facilitate affect regulation and confer mental and physical health benefits (e.g., Bowlby, 1988; Diamond & Hicks, 2004; Harlow, 1958; Ryff & Singer, 2001). Supporting this view, extant research indicates that an attachment figure's actual or imagined presence down-regulates negative affective and physiological responses to external social stressors (e.g., giving a public speech; Grewen, Anderson, Girdler, & Light, 2003) and physical ones (e.g., receiving a mildly painful shock; Coan, Schaefer, & Davidson, 2006). But not all threats are external to the self. Some of the most pernicious threats are internally generated. Indeed, internally generated distressing cognitions characterize various physical and psychological disorders and are targets of various forms of therapy (e.g., Brewin, 2007; Brosschot, Gerin, & Thayer, 2006; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Surprisingly, to date, no work has directly examined whether the mental representation of an attachment figure facilitates the regulation of affect elicited by such internally generated stressors.

The current research addressed this issue, focusing specifically on the following four questions: Does imagining being supported by an attachment figure, or merely viewing a photograph of him or her, facilitate the regulation of affect triggered by thinking about an upsetting memory? Do such affect regulation benefits depend on whether the attachment figure representation is activated *before* or *after* thinking about the upsetting memory? Does activating the attachment figure representation also decrease the accessibility of negative thoughts in one's stream of consciousness following upsetting memory recall and do the attachment-induced affect



regulation benefits predict subsequent mental and physical well-being? Finally, do individual differences in adult attachment style amplify or dampen any affect regulation benefits conferred by activating the attachment figure representation?

### **Attachment and Affect Regulation**

Whether a primary caregiver during infancy or a romantic partner during adulthood, attachment figures instill a sense of safety and protection (also referred to as “felt security”; Sroufe & Waters, 1977). A normative function of attachment figures involves affect regulation (e.g., Bowlby, 1982; Mikulincer & Shaver, 2007a). When an individual feels distressed—as a result of appraising the environment as threatening or the self as in need of help—she seeks proximity to her attachment figure. If the attachment figure is available and responsive, the resulting contact alleviates distress. Restoration of felt security, in turn, enables the individual to resume exploration of the environment and other daily activities.

Numerous experimental and observational studies in both the child (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; Larson, Gunnar, & Hertzgaard, 1991) and adult attachment literatures (e.g., Coan, 2008; Ditzen, Neumann, Bodenmann, von Dawans, Turner, Ehlert, et al., 2007) provide support for the proposition that attachment figures enhance affect regulation (see Sbarra & Hazan, 2008; Selcuk, Zayas, & Hazan, 2010, for reviews). For instance, in adulthood, intimate and supportive interactions with a romantic partner, as compared to non-supportive interactions with a partner or being alone, lead to greater calmness while anticipating a stressor (e.g., Simpson, Rholes, & Nelligan, 1992), smaller elevations in self-reported anxiety and physiological reactivity (i.e., systolic blood pressure, diastolic blood pressure, heart rate, and cortisol level; e.g., Collins & Ford, 2010; Ditzen et al., 2007; Grewen et al., 2003) and

attenuation of neural threat responses while experiencing a stressor (e.g., Coan et al., 2006), and faster emotional recovery following a stressor (e.g., Collins & Ford, 2010).

The regulatory benefits of attachment figures are realized not only through physical proximity and actual interactions with attachment figures but also through their symbolic presence (e.g., Hofer, 1984; Mikulincer & Shaver, 2007a). Over time, interactions with attachment figures are stored in memory as mental representations (also referred to as internal working models; e.g., Bowlby, 1973, 1982; Bretherton & Munholland, 2008; Collins, Guichard, Ford, & Feeney, 2004; Pietromonaco & Feldman Barrett, 2000). These representations consist of detailed memories of interactions with, and conscious and unconscious affective evaluations of, attachment figures (e.g., Günaydin, Zayas, Selcuk, & Hazan, 2012; Zayas & Shoda, 2005) as well as strategies to regulate negative affect (e.g., turning to attachment figures to alleviate negative affect or turning away from attachment figures and coping through other means; e.g., Baldwin, Fehr, Keedian, Seidel, & Thomson, 1993) in stressful and threatening situations (e.g., Collins et al., 2004; Pietromonaco, Feldman Barrett, & Powers, 2006). Repeated positive interactions with attachment figures during times of stress reinforce the association in long-term memory between bids for support and stress reduction (e.g., Beckes, Simpson, & Erickson, 2010; Mikulincer & Shaver, 2007a). As a result, it is hypothesized that mental representations of attachment figures become capable of activating psychological and physiological states of safety and calmness originally induced by actual interactions with them (e.g., Depue & Morrone-Strupinsky, 2005; Uvnäs-Moberg, 1998). In line with recent work showing that priming a social construct biases behavior (e.g., Ferguson & Zayas, 2009, for a discussion), this view suggests that merely calling to mind attachment figures in stressful situations confers regulatory benefits.

An extensive body of research has documented the effects of activating attachment-related representations on individuals' attitudes and behaviors (see Gillath, Selcuk, & Shaver, 2008; Mikulincer & Shaver, 2007b, for reviews). Yet, only a few of these studies have implications for affect regulation. Mikulincer, Hirschberger, Nachmias, and Gillath (2001) showed that in stressful contexts (after receiving negative feedback or being primed with a threat word), exposure to attachment-related stimuli elicited automatic positive reactions, whereas positive nonattachment stimuli did not. These findings suggest that the representation of an attachment figure is unique in its ability to restore positive affect after a stressful event. In addition, Eisenberger and colleagues (Eisenberger, Master, Inagaki, Taylor, Shirinyan, Lieberman, & Naliboff, 2011; Master, Eisenberger, Taylor, Naliboff, Shirinyan, & Lieberman, 2009) demonstrated that viewing a photograph of one's romantic partner (vs. a stranger or an object) reduced participant's subjective experience of pain while receiving thermal stimulation at levels slightly higher than one's pain thresholds.

### **Do Mental Representations of Attachment Figures Facilitate Affect Regulation in Response to Internal Stressors?**

Although existing findings provide evidence that activating mental representations of attachment figures confer affect regulatory benefits, past work has focused solely on external stressors. Yet, stressors are often times internally generated. Memories of upsetting events spontaneously come to mind in individuals' daily life (e.g., Ayduk & Kross, 2010) and are associated with increased negative affect (Kross, Davidson, Weber, & Ochsner, 2009) and cognition (Kross & Ayduk, 2008). The negative thinking triggered by recalling an upsetting past event maintains and enhances the initially experienced negative affective response, increasing the likelihood for becoming entrapped in rumination—a state characterized by focusing

repeatedly and passively on the events that cause negative affect (e.g., Nolen-Hoeksema et al., 2008). Not surprisingly, research has shown that difficulty in coping with upsetting autobiographical memories and resulting rumination increases susceptibility to psychological disorders such as depression and generalized anxiety disorder (e.g., Brewin, 2007; Mathews & MacLeod, 2005; Nolen-Hoeksema et al., 2008) and physical disorders such as cardiovascular disease (e.g., Brosschot et al., 2006; Schwartz, Gerin, Davidson, Pickering, Brosschot, Thayer et al., 2003).

To date, no study has investigated whether activating the mental representation of an attachment figure confers regulatory benefits in response to thinking about an upsetting memory. A related question, which has not received attention, is whether the affect regulation benefits depend on whether the representation is activated *before* or *after* exposure to the stressor? Answers to these questions have implications for both the attachment and emotion regulation literatures.

According to attachment theory, attachment figures should enhance the regulation of negative affect triggered by stressors regardless of whether they are external or internal and regardless of whether the representation is primed before or after the stressor. If the representation of an attachment figure is activated *before* the occurrence of a stressor, it would be expected to automatically activate positivity (e.g., Zayas & Shoda, 2005) and lead to feelings of calmness and safety. This, in turn, could decrease the extent to which the event is appraised as stressful, or a person's reactivity when recalling the event, and thus, decrease negative affect. Henceforth, this is referred to as the *buffering hypothesis*. Indeed, such a possibility is supported by studies showing that people are less physiologically reactive to an external stressor following

an interaction with an attachment figure (e.g., Ditzen et al., 2007; Grewen et al., 2003; Kamarck, Manuck, & Jennings, 1990).

If the representation of an attachment figure is activated *after* stress exposure, the positivity and feelings of calmness induced would be expected to promote recovery and help individuals return to their affective baseline. In line with this prediction, prior research shows that mental representations of attachment figures consist of “if-then” contingencies (e.g., Baldwin et al., 1993; Collins et al., 2004) that reflect expectations about interactions with attachment figures (e.g., “If I am upset, then my partner will comfort me”). This expectation of comfort when distressed suggests the possibility that following the recall of an upsetting memory a simple reminder of the attachment figure would provide relief. Hereafter, this is referred to as the *recovery hypothesis*. Indeed, when discussing personal worries, a partner’s responsiveness has been shown to immediately improve mood (e.g., Collins & Feeney, 2000).

In contrast to the attachment perspective, research and theory on emotion regulation indicates that the effectiveness of affect regulation strategies depend on a number of factors, including whether the source of the affect is external or internal and the timing of the affect regulation strategy in relation to the stressor. Specifically, recent findings show that emotion induced by an internal vs. external event is supported by partially distinct neural systems (Ochsner, Ray, Hughes, McRae, Cooper, Weber et al., 2009). One critical implication of this work is that whether the emotion is induced by an internal vs. external event affects the effectiveness of particular affect regulation strategies. For example, McRae, Misra, Prasad, Pereira, and Gross (2012) have shown that reappraising a situation in nonemotional terms (vs. responding naturally) led to greater decrease in self-reported negative affect in response to an internally generated negative event compared to an external one. In addition, Gross’ (Gross,

1998, 2001) theory of antecedent- vs. response-focused emotion regulation suggests that the timing of an affect regulation strategy relative to the stressor impacts its success. Although his work has focused on reappraisal and suppression, it highlights the importance of timing in the effectiveness of affect regulation strategies.

In sum, the attachment perspective suggests that both the buffering and recovery effect could serve to independently promote affect regulation in response to an internally generated stressor. However, given findings in the emotion regulation literature showing that the effectiveness of affect regulation strategies vary as a result of various factors (e.g., whether the stressor is external vs. internal, timing of stressor relative to the strategy), we believed that neither the buffering nor recovery hypothesis could be assumed to occur for internal stressors. Testing both hypotheses empirically is needed.

### **Individual Differences in Adult Attachment**

According to attachment theory, the affect regulation benefits conferred by the presence of attachment figures are a normative process that characterizes attachment relationships in general (e.g., Bowlby, 1982; Selcuk et al., 2010). Nonetheless, these basic processes are expected to vary as a function of individual differences in a person's *attachment style*, that is, the characteristic ways a person feels, thinks, and behaves with an attachment figure. Specifically, individuals with different attachment style possess representations of attachment figures that vary in valence and content. These differences, in turn, are expected to affect the ability to obtain affect regulation benefits from the attachment representation.

With respect to individual differences in adult attachment styles, the two primary dimensions are *anxiety* (characterized by intense worries about abandonment) and *avoidance* (characterized by discomfort with depending on relationship partners) (e.g., Fraley, Waller, &

Brennan, 2000). Both high avoidance and high anxiety have been linked to problems in affect regulation (e.g., Mikulincer & Shaver, 2007b). However, they differ in that avoidance is expected to be more likely to modulate the extent to which individuals rely on and obtain affect regulation benefits from attachment figures in stressful contexts (e.g., Coan, 2008) whereas anxiety is expected to be more likely to modulate reactivity to separation from attachment figures (e.g., Diamond, Hicks, & Otter-Henderson, 2008). Consistent with this idea, avoidant individuals possess less positive automatic evaluations of attachment figures (e.g., Zayas & Shoda, 2005) and less positive interpersonal expectations (e.g., Baldwin et al., 1993), and prefer to cope with aversive situations by themselves vs. relying on an attachment figure (e.g., Collins & Feeney, 2000; Pietromonaco & Feldman Barrett, 2006; Simpson et al., 1992). Moreover, studies have shown that in response to external stressors avoidant individuals obtain less regulatory benefits from contact with attachment figures (e.g., Carpenter & Kirkpatrick, 1996; Coan, 2008; Ditzen, Schmidt et al., 2008).

### **Overview of the Present Studies**

The present research investigated the effect of activating the mental representation of an attachment figure on affect regulation in response to an upsetting memory recall. Specifically, participants were asked to relive a personally upsetting autobiographical memory using a reliable and well-validated procedure for investigating the effects of internally generated stressors (Kross & Ayduk, 2011; Kross, Bermman, Mischel, Smith, & Wager, 2011). The mental representation of the attachment figure (mother in Studies 1 and 2 and romantic partner in Study 3) was activated either before or after memory recall, affording empirical tests of both the buffering hypothesis (Studies 1 and 2) and the recovery hypothesis (Studies 1-3) using the same experimental paradigm. Study 1 investigated whether imagining being supported by an

attachment figure leads to buffering or recovery effects as assessed by participants' explicit self-reported affect ratings. To extend the Study 1 findings, Studies 2 and 3 used a different priming technique (i.e., simply viewing the photograph of the attachment figure) and used an implicit measure of negative affect (Quirin, Kazén, & Kuhl, 2009) that is less susceptible to various biases including demand effects and self-presentational concerns. In addition, Study 3 investigated whether activating the mental representation of an attachment figure reduces negative thinking following an upsetting memory recall and whether the affect regulation benefits observed in the laboratory predict psychological and physical health assessed at least one month after the study. Finally, in Study 4, a meta-analysis was performed on the combined data from Studies 1 through 3 to obtain reliable estimates of the association between attachment style and the magnitude of regulatory effects.

## Study 1

### Method

**Participants.** One hundred twenty-three undergraduate students (105 women) participated in the study for course credit. During a training session where participants practiced recalling an upsetting memory when presented with a cue (see the Procedure and materials section for details), one participant was not able to recall one of the memories in less than 20 seconds, the amount of time allotted for memory recall during the actual experiment, and was excluded from the sample. The mean age of the final sample was 20 years ( $SD = 2.80$  years). The racial composition of the sample was 63% Caucasian, 25% Asian or Asian American, 3% African American, 3% Hispanic/Latino, and 6% other ethnicities.

**Procedure and materials.** *Overview.* The study consisted of an online survey and an experimental session that was held 1-2 days later. The online survey included a measure of



attachment style (described in the Method section of Study 4) and a questionnaire prompting participants to generate upsetting autobiographical memories. The experiment had a mixed design with timing (recovery vs. buffering) as the between-participants factor and the prime (attachment figure vs. acquaintance) as the within-participants factor. At the start of the experimental session, participants completed a short training session to gain practice bringing to mind the upsetting memories they had generated in the online survey. After training, participants were randomly assigned to either the recovery condition ( $n = 55$ ) or the buffering condition ( $n = 67$ ) and completed the Attachment Affect Regulation Task (AART), a computer-based task specifically developed to test the effect of attachment figure representations on affect regulation in response to thinking about an upsetting memory. Upon completion of the experiment, participants were probed for suspicion and fully debriefed about the purposes of the study.

*Generating upsetting autobiographical memories.* To ensure that participants would be able to recall an upsetting memory during the experiment, participants were asked to write in detail about two upsetting autobiographical memories prior to the experimental session using procedures adapted from Kross et al. (2009). They were told that these memories could refer to any type of negative experience as long as they did not involve participants' mother. Participants were first asked to describe the memory in detail (what happened, why it was a negative experience, where it took place, when it occurred, who else was present, etc.). They then constructed a "memory cue," which consisted of 1-3 words. It was to be used in the experimental session to help them recall the memory. After writing about each memory and providing a cue, participants rated the event's significance in their lives using the following 8-item scale developed for the present study: "*When this event happened, how significant was the event in your life?*", "*How significant is the event in your life currently?*", "*When you recall this*

*experience now, how bad do you feel?”*, “*When this event happened, how bad did you feel?”*, “*When you think about this experience, how vividly does it come to mind?”*, “*How frequently have you thought about this experience since it happened?”*, “*How frequently do you think about this experience currently?”*, and “*How frequently did you think about this event soon after it occurred?”*. Participants answered the questions using a 7-point scale (1 = *Not very*, 4 = *Somewhat*, 7 = *Very*). Average Cronbach’s alpha was .86 and the average significance rating was 4.86 (significantly above the midpoint,  $t(121) = 10.23, p < .001$ ) across the two memories.

*Memory recall training.* Based on previous studies (e.g., Kross et al., 2009), participants completed a memory recall training before performing the AART. This training ensured that they would be able to bring the memory to mind within the allotted time during the actual AART. First, participants were presented with the description of each memory along with the cue to recall it on a computer screen. They were given as much time as they needed to pair the cue with the memory so that they would be able to quickly recall the memory when they saw the corresponding cue during the AART. Participants obtained practice for both memories. Next, one of the two memory cues was randomly presented on the computer screen without the description of the memory and participants were asked to press the space bar as soon as they were able to recall the specific memory to which the cue referred. Reaction time data were examined to ensure that participants recalled the memory in less than 20 seconds—the amount of time allotted during the AART for memory recall.

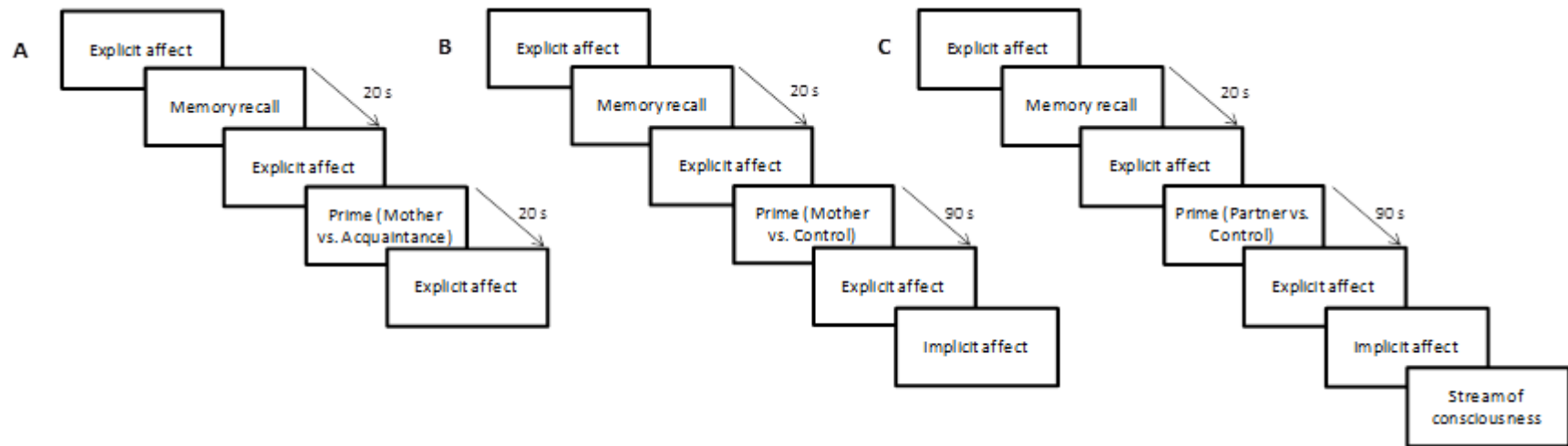
*Nominating an acquaintance.* After completing the training, participants were asked to nominate an acquaintance, which was defined as someone “*who has little impact on your life. This person may be someone you interact with on a regular basis on a superficial level or*

*someone whom you have only met a few times*” (McGowan, 2002). They were asked to think about this person whenever asked to think about an acquaintance when completing the AART.

*Attachment Affect Regulation Task (AART)*. As shown in Figure 2.1a, each trial of the AART consisted of an upsetting memory recall and the prime manipulation. Participants indicated how they felt at the moment (“*How bad do you feel at the moment?*” and “*How good do you feel at the moment?*”) on a 7-point scale (1 = *Not at all*, 4 = *Somewhat*, 7 = *Extremely*) at the beginning of the trial (baseline), after recalling the upsetting memory (post-memory), and after the prime (post-prime). Because positive and negative affect were moderately to strongly correlated across Studies 1-3 (ranging from -.54 to -.81 in Study 1, -.48 to -.78 in Study 2, and -.49 to -.67 in Study 3), and the main tests of the buffering and recovery hypotheses led to similar conclusions when positive and negative affect were analyzed separately, a composite negative affect score was computed by averaging negative affect and reverse-scored positive affect. Average Cronbach’s alphas across trials, for each negative affect assessment and as a function of prime condition in Study 1 ranged from .69 to .86.

The AART was exactly the same in both the recovery and buffering conditions except for the placement of the prime manipulation in relation to the memory recall. In the recovery condition, the mother (or acquaintance) prime was presented *after* the memory recall. In the buffering condition, the mother (or acquaintance) prime was presented *before* the memory recall.

During the upsetting memory recall, the memory cue appeared on the screen and participants were asked to recall the experience to which the cue referred as fully as possible. Specifically, participants were told that “*as you recall the experience, please let your deepest thoughts and emotions about this experience run through your mind.*” Previous studies (e.g., Kross, Berman, Mischel, Smith, & Wager, 2011) showed that a memory recall as short as



**Figure 2.1.** Schematic representation of an AART trial in the recovery condition. (A) Study 1, (B) Study 2, and (C) Study 3.

The structure of the trial in the buffering condition (Studies 1 and 2) was exactly the same except that the prime preceded memory recall.

fifteen seconds is sufficient to induce subjective negative affect and increase activation of neural regions involved in affective processing. Accordingly, in the current study, the memory recall lasted 20 seconds, during which the memory cue remained on the screen.

The prime manipulation consisted of a mental imagery task designed to activate the representation of one's mother or an acquaintance. Participants were asked to imagine as vividly as possible that they were supported and comforted by their mother (mother condition) or the acquaintance (acquaintance condition). This task lasted 20 seconds as well.

The AART consisted of two blocks (the mother block and the acquaintance block). Participants completed two trials in each block (one with each upsetting memory) for a total of four trials. To provide a mental cleanse in between trials, participants completed a distracter task consisting of a series of simple one or two-digit addition questions (e.g.,  $22 + 55 = ?$ ) before starting the next trial (average time to complete the distracter task = 21 seconds,  $SD = 4.7$ ). The order in which the two blocks were presented (mother block first and acquaintance block second, or vice versa) was counterbalanced across participants.

**Data analytic strategy.** The goal of the data analytic strategy was to quantify the extent to which the attachment figure prime helped maintain baseline levels of affect in the face of an upsetting memory recall (buffering hypothesis) or restore affect to baseline levels following memory recall (recovery hypothesis). Thus, change in negative affect relative to baseline level was the focus of assessment. Accordingly, for each trial, baseline negative affect was subtracted from post-memory negative affect and from post-prime negative affect. For simplicity, these change scores are referred to as *post-memory*  $NA_{\Delta}$  and *post-prime*  $NA_{\Delta}$ , respectively. For both post-memory and post-prime  $NA_{\Delta}$ , a score of zero reflects no change in negative affect as compared to baseline, a positive  $NA_{\Delta}$  score reflects increased negative affect as compared to

baseline, and a negative  $NA_{\Delta}$  score reflects decreased negative affect as compared to baseline. By correcting for baseline negative affect, on a trial-by-trial basis within each participant, we could rule out the possibility that differences in negative affect may arise over time in the prime conditions (e.g., increasing negative affect in the control prime condition). After performing the baseline correction, we averaged the  $NA_{\Delta}$  scores across trials in the same block. The recovery and buffering hypotheses were tested via separate repeated measures ANOVAs with prime (mother vs. acquaintance) as the within-participant factor. The dependent variables were post-prime  $NA_{\Delta}$  in the recovery condition and post-memory  $NA_{\Delta}$  in the buffering condition.<sup>2</sup>

## Results and Discussion

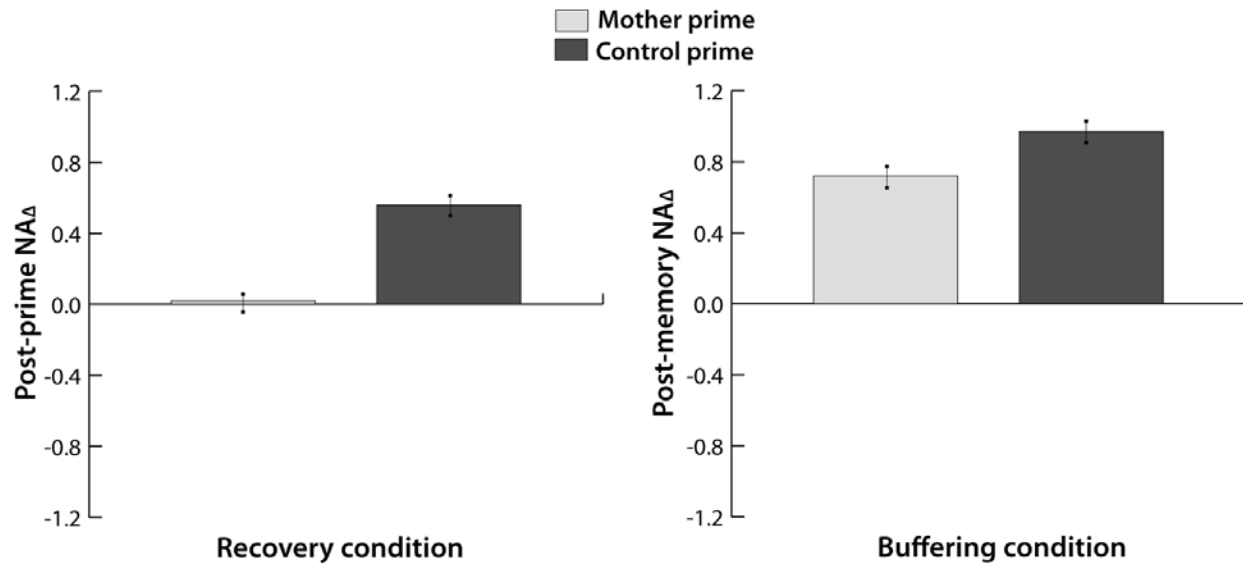
**Effect of upsetting memory recall on negative affect.** Consistent with previous work (Kross et al., 2009), the upsetting memory recall induced negative affect. This was reflected by post-memory  $NA_{\Delta}$  scores that were significantly above zero in both the buffering and recovery conditions ( $M_s > .85$ ,  $t_s > 8.41$ ,  $p_s < .001$ , Cohen's  $d_s > 1.03$ ). Participants reported significantly greater negative affect in response to the memory recall in the first block of the AART than the

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<sup>2</sup> In Studies 1-3, we performed supplementary analyses to test whether the effect of the prime (attachment vs. control) on each variable of interest was moderated by *order* of the AART blocks (attachment figure block first vs. control block first) and *significance* of the upsetting event. There were no statistically significant main effects of or interactions with significance of the upsetting event. However, four (out of 9) analyses revealed an unpredicted, statistically significant, order by prime interaction. Follow-up tests using data from only the first block of the AART and treating prime type (attachment figure vs. control) as the between-participants variable produced similar results and conclusions to those reported in the text. Thus, for simplicity, order and significance were not included in the final model.

second block ( $ps < .01$ ), suggesting habituation to the effects of memory recall. Nevertheless, recalling the same upsetting memories the second time still induced negative affect ( $M_s > .65$ ,  $ts > 5.58$ ,  $ps < .001$ ,  $ds > .68$ ).

**Recovery hypothesis.** Supporting the recovery hypothesis, participants showed significantly lower negative affect, as reflected by lower post-prime  $NA_{\Delta}$ , after the mother prime than the acquaintance prime ( $F(1, 54) = 15.39$ ,  $p < .001$ ,  $\eta_p^2 = .22$ , Figure 2.2). These results indicate that imagining being supported and comforted by one's mother (vs. an acquaintance) following an upsetting memory recall leads to greater affective recovery.



**Figure 2.2.** Bars represent post-prime  $NA_{\Delta}$  in the recovery condition (left panel) and post-memory  $NA_{\Delta}$  in the buffering condition (right panel) as a function of prime (mother vs. control) in Study 1. Error bars represent one standard error above and below the mean. A  $NA_{\Delta}$  score of zero reflects no change in negative affect as compared to baseline, a positive  $NA_{\Delta}$  score reflects increased negative affect as compared to baseline, and a negative  $NA_{\Delta}$  score reflects decreased negative affect as compared to baseline.

**Buffering hypothesis.** Priming one's mother (vs. an acquaintance) before recalling an upsetting memory led to lower negative affect in response to the upsetting memory recall as reflected by lower post-memory  $NA_{\Delta}$ . However, this effect did not reach conventional levels of significance ( $F(1, 66) = 3.22, p = .077, \eta_p^2 = .05$ ).<sup>3</sup>

In sum, Study 1 provides the first evidence that activating the mental representation of an attachment figure facilitates recovery from negative affect triggered by an upsetting autobiographical memory recall—essentially facilitating the restoration of mood to baseline levels and supporting the recovery hypothesis. Interestingly, although priming an attachment representation buffered against negative affect in response to the memory recall, the effect was only marginally significant (at  $p < .10$ ). Therefore, the buffering and recovery hypotheses were tested again in Study 2 using a different priming manipulation.

One alternative explanation for the recovery effect is that it may have been caused by differences in distraction elicited by the prime stimuli rather than the mental representation of the mother facilitating recovery. Mental representations of attachment figures are more complex, richer, and more detailed than those of acquaintances (e.g., Andersen & Cole, 1990; Collins et

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<sup>3</sup> In Study 1 and 2, we compared the magnitude of the recovery vs. buffering effects by entering buffering vs. recovery as a between-participants factor in the model. In Study 1, the main effect of prime was significant ( $F(1, 120) = 16.21, p < .001, \eta_p^2 = .12$ ). The prime  $\times$  timing interaction was not statistically significant at conventional levels ( $F(1, 120) = 2.35, p = .13, \eta_p^2 = .02$ ). In Study 2, for explicit NA, the main effect of prime ( $F(1, 136) = 27.71, p < .001, \eta_p^2 = .17$ ) was qualified by a prime  $\times$  timing interaction ( $F(1, 136) = 10.50, p = .002, \eta_p^2 = .07$ ). For implicit NA, there was a marginally significant effect of prime ( $F(1, 136) = 2.94, p = .09, \eta_p^2 = .02$ ) and the prime  $\times$  timing interaction was at the trend level ( $F(1, 136) = 2.29, p = .13, \eta_p^2 = .02$ ).



al., 2004). When asked to imagine being supported and comforted by their mother, participants may have recalled or imagined a very detailed scene, and thus may have been more distracted, compared to when they were asked to imagine being supported by an acquaintance. The priming technique used in Study 2 was designed to assess the extent to which participants were distracted and thus provides a test of this alternative explanation.

## **Study 2**

Study 2 had three aims. The first was to conceptually replicate the findings of Study 1 especially given the inconclusive evidence for the buffering hypothesis. The second aim was to test the recovery and buffering hypotheses using a different priming manipulation. The effectiveness of the prime manipulation used in Study 1 depends on a number of factors, including the relative accessibility of memories in which one's mother provided support and comfort as well as participants' effort and willingness to imagine such an interaction, and one's meta-cognition of the ease and speed of the recall process (e.g., Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka, & Simons, 1991). Thus, based on prior research showing that the regulatory benefits of attachment figures can be realized spontaneously, automatically, and effortlessly (e.g., Coan, 2008; Coan et al., 2006; Sbarra & Hazan, 2008), Study 2 primed the attachment representation by simply exposing participants to a photograph of their mother, without requiring any explicit recollection of a supportive interaction.

Study 2 also afforded a test of an alternative explanation. Namely, in Study 1, the prime manipulation of recalling a supportive interaction involving one's mother, versus an acquaintance, may have elicited a richer, more detailed memory, which may have led to greater distraction. Thus the greater recovery observed in the mother (vs. acquaintance) condition could have been the result of manipulating distraction, rather than the attachment representation per se.

To investigate this possibility, during the photograph priming manipulation used in Study 2, participants were asked to locate randomly occurring visual stimuli on a computer screen. We reasoned that if the attachment prime leads to greater distraction compared to the control prime, then participants should be slower at indicating the location of the stimuli in the attachment prime condition (see Master et al., 2009 for a similar approach).

The third aim of Study 2 was to complement the Study 1 findings by using an implicit measure of negative affect. Although self-reports provide reliable and valid assessments of affect (e.g., Diener, 2000), they are susceptible to a variety of biases such as self-presentational concerns, demand effects, and individuals' beliefs about emotions (how one *should* feel in a particular situation; e.g., Robinson & Clore, 2002). Implicit measures provide an index of affect in a manner that is less overt, and thus less susceptible to conscious control. Support for the regulatory effects with an implicit measure would further increase confidence in the effects obtained in Study 1.

## **Method**

**Participants.** One hundred thirty-nine undergraduate students (105 women) participated in the study in exchange for course credit ( $n_s = 70$  and 69 in the recovery and buffering conditions, respectively). During the memory recall training, one participant in the buffering condition did not recall a memory in less than 20 seconds, which was a prerequisite for performing the AART, and was removed from the sample. The mean age of the final sample was 20 years ( $SD = 1.59$  years). The racial composition was 62% Caucasian, 19% Asian or Asian American, 7% African American, 5% Hispanic/Latino, and 7% from other ethnic backgrounds.

**Procedure and materials.** *Overview.* The materials and procedure were exactly the same as those described in Study 1 except that the prime manipulation in Study 2 involved participants

viewing a photograph of their mother (instead of imagining a supportive interaction) and a measure of implicit negative affect was administered at the end of each AART trial (Figure 2.1b).

*Prime manipulation.* In the prime manipulation phase of the AART, the photograph of the participant's mother or another participant's mother appeared in the center of the screen. To ensure that participants attended to the photograph and to assess whether they were more distracted in one prime condition than the other, a yellow equilateral triangle (0.3 inches) was randomly presented for 300 ms (interstimulus interval of 3000 ms) at one of six possible locations (i.e., upper left, mid-left, lower left, upper right, mid-right, lower right side of the photograph). Participants indicated the position of the triangle by pressing the “*d*” (for left) or “*k*” (for right) buttons on the keyboard. Thirty triangle stimuli were presented (five flashes at each location) ensuring a 90-second prime exposure. The accuracy rate was high (> 98%) and did not differ across condition ( $p = .56$ ). Mean latency to locate stimuli in each condition was computed by averaging reaction times for correctly classified trials.

To obtain stimuli for the prime manipulation, participants submitted a digital photograph of their mother's face in which she is directly facing the camera and not wearing any items that obscure her face (e.g., sunglasses). A research assistant confirmed that the photograph adhered to the instructions and standardized it by replacing the background with a gray fill and resizing the photograph to 5 × 5 inches.

*Implicit negative affect.* Implicit negative affect was assessed using a modified version of the Implicit Positive and Negative Affect Test (IPANAT; Quirin, Kazén, & Kuhl, 2009). Participants saw letter strings (e.g., “*LINTE*”) that were supposedly from an artificial language and indicated, “*how well each artificial word expresses different moods*” on a 4-point Likert

scale (*Does not fit at all* to *Fits very well*). Previous studies have shown that the IPANAT is sensitive to state variations in affect induced by negative stimuli (Quirin, Kazén, & Kuhl, 2009) and that greater negative affect as assessed by the IPANAT is associated with higher cortisol responses to a laboratory stressor (Quirin, Kazén, Rohrman, & Kuhl, 2009), providing empirical support for the construct validity of the instrument as an implicit measure of negative affect. The original version of the IPANAT uses six adjectives: *happy*, *energetic*, *cheerful*, *tense*, *helpless*, and *inhibited*. To more adequately capture negative affect triggered by the memory recall, we replaced these adjectives with *distressed*, *anxious*, *threatened*, *upset*, *secure*, *relaxed*, and *calm* (with the last three adjectives reverse-scored). Given the length of the measure, we could not assess implicit affect repeatedly within each trial. Instead, participants completed the measure once at the end of each trial (see Figure 2.1b). That is, at the end of each trial, participants were shown one (of four) artificial word and were asked to indicate how well each of the seven adjectives fits the word. Participants saw a different artificial word each time they completed the measure. Average Cronbach's alpha across trials and for each prime condition separately was high, ranging from .81 to .84.

**Data analytic strategy.** The data analytic strategy was the same as in Study 1.

## **Results and Discussion**

**Effect of upsetting memory recall on negative affect.** As in Study 1, the upsetting memory recall induced negative affect as reflected by post-memory  $NA_{\Delta}$  scores significantly above zero in both the buffering and recovery conditions ( $M_s > .78$ ,  $t_s > 8.30$ ,  $p_s < .001$ ,  $d_s > 1.01$ ). Participants reported significantly greater negative affect in response to the memory recall in the first block of the AART than the second block ( $p_s < .001$ ). Nevertheless, recalling the

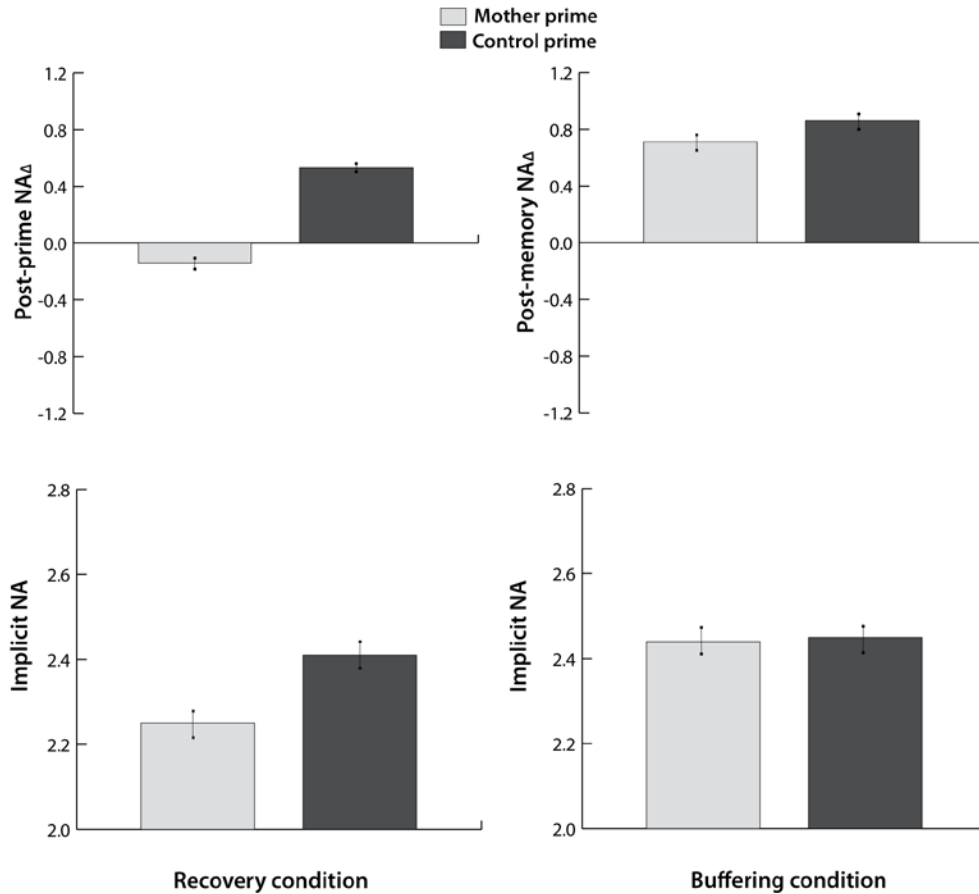
same upsetting memories the second time continued to induce negative affect ( $M_s > .57$ ,  $t_s > 5.60$ ,  $p_s < .001$ ,  $d_s > .68$ ).

**Effect of prime on distraction.** Inspection of reaction times to locate the stimuli during the priming task revealed no evidence that the attachment figure prime was more distracting than the control prime in either the recovery condition ( $F(1, 69) = 2.86$ ,  $p = .10$ ,  $\eta_p^2 = .04$ ) or the buffering condition ( $F(1, 67) = 3.52$ ,  $p = .07$ ,  $\eta_p^2 = .05$ ). In fact, the trend was in the opposite direction with participants being slower during the control prime task than the mother prime task (recovery condition:  $M = 384.67$ ,  $SE = 9.15$  vs.  $M = 377.73$ ,  $SE = 8.64$ ; buffering condition:  $M = 387.71$ ,  $SE = 11.62$  vs.  $M = 372.43$ ,  $SE = 8.87$ ).

**Recovery hypothesis.** As in Study 1, participants in the recovery condition showed greater recovery from an upsetting memory recall, as assessed by post-prime  $NA_\Delta$ , after being exposed to a photograph of their mother versus a photograph of another participant's mother ( $F(1, 69) = 40.80$ ,  $p < .001$ ,  $\eta_p^2 = .37$ ) (Figure 2.3). Furthermore, after the upsetting memory recall, viewing the photograph of one's mother led to lower implicit negative affect than viewing the photograph of another participant's mother ( $F(1, 69) = 4.44$ ,  $p = .039$ ,  $\eta_p^2 = .06$ ).<sup>4</sup>

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<sup>4</sup> Nineteen participants in Study 2 (10 in the buffering and 9 in the recovery condition) and one participant in Study 3 correctly guessed the purpose of the implicit negative affect measure during debriefing. When the analyses were repeated after removing these participants, the findings remained the same in both Study 2 (recovery condition:  $F(1, 60) = 3.45$ ,  $p = .068$ ,  $\eta_p^2 = .054$ ; buffering condition:  $F(1, 57) = .04$ ,  $p = .85$ ,  $\eta_p^2 = .00$ ) and Study 3 ( $F(1, 110) = 2.89$ ,  $p = .092$ ,  $d = .32$ ).



**Figure 2.3.** Bars represent post-prime  $NA_{\Delta}$  in the recovery condition (top left panel), post-memory  $NA_{\Delta}$  in the buffering condition (top right panel), implicit negative affect in the recovery condition (bottom left panel), and implicit negative affect in the buffering condition (bottom right panel) as a function of prime (mother vs. control) in Study 2. Error bars represent one standard error above and below the mean. A  $NA_{\Delta}$  score of zero reflects no change in negative affect as compared to baseline, a positive  $NA_{\Delta}$  score reflects increased negative affect as compared to baseline, and a negative  $NA_{\Delta}$  score reflects decreased negative affect as compared to baseline.

**Buffering hypothesis.** As was the case in Study 1, there was no empirical support for the buffering hypothesis. Viewing the photograph of one's mother (vs. another participant's mother) before an upsetting memory recall did not lead to significantly lower negative affect, as assessed by explicit post-memory  $NA_{\Delta}$  ( $F(1, 67) = 1.83, p = .18, \eta_p^2 = .03$ ). Furthermore, there was no statistically significant difference between the mother and control conditions in participants' implicit negative affect in response to upsetting memory recall ( $F(1, 67) = .025, p = .87, \eta_p^2 = .00$ ).

In sum, Study 2 showed that simply viewing the photograph of one's mother (vs. another participant's mother)—in the absence of explicit instructions to imagine or recall an interaction—enhanced recovery following an upsetting memory recall as assessed by both explicit and implicit measures of negative affect. Because the manipulation in Study 2 did not involve explicit instructions to recall supportive interactions, these findings support the proposition that attachment figures confer regulatory benefits automatically, without any conscious effort (Coan, 2008; Sbarra & Hazan, 2008) and suggest that attachment figure reminders, such as simply viewing a photograph of an attachment figure, can be a relatively effortless and efficient way of coping with negative events.

Study 2 also investigated the possibility that recovery effects are due to differential distraction caused by the attachment figure prime. There was no evidence that the attachment prime was more distracting than the control prime as reflected by the latency to respond to unrelated visual stimuli during the priming task. These findings further support the conclusion that the observed effects are due to the attachment representations enhancing affective recovery.

With regards to the buffering hypothesis, Study 2 showed that viewing the photograph of one's mother (vs. another participant's mother) before recalling an upsetting memory did not

lead to appreciably lower explicit or implicit negative affect in response to memory recall. Taken together with the Study 1 findings, we found no clear support for the buffering hypothesis using two distinct methods for activating the mental representation of an attachment figure and two distinct instruments for measuring affect. Because the buffering manipulation failed to reliably lessen negative affect elicited by the upsetting memory recall, Study 3 focused only on the recovery hypothesis. (Possible explanations for the absence of support for the buffering hypothesis are discussed in the General Discussion.)

### **Study 3**

Study 3 aimed to further investigate the recovery effects induced by activating the mental representation of an attachment figure in a number of ways. Given theory and empirical evidence that romantic partners not only serve attachment functions, but are the prototypical attachment figure in adulthood (e.g., Hazan & Shaver, 1987; Zeifman & Hazan, 2008), Study 3 assessed whether activating partner representations promotes affective recovery following an upsetting memory recall. Because Study 3 required the recruitment of romantic couples, it also ensured an approximately equal number of men and women. Given that past work has sometimes found gender differences in attachment processes (e.g., Del Giudice, 2011; Diamond, Hicks, & Otter-Henderson, 2008), Study 3 aimed to test whether the recovery effects, obtained in Studies 1 and 2 whose samples consisted disproportionately of women, occur for both men and women, and whether there is a gender difference.

Moreover, a central aim of Study 3 was to examine whether activating the mental representation of one's romantic partner would lessen the tendency to engage in negative thinking. Although research increasingly has investigated the cognitive strategies (e.g., reframing, distancing; Kross & Ayduk, 2011; Ochsner & Gross, 2008) that might reduce



negative thinking following a negative event, to date, no study has directly examined the role of attachment figure representations on reducing tendencies for negative thinking. Indirect evidence for this proposition comes from previous research from the terror management theory perspective (Cox, Arndt, Pyszczynski, Greenberg, Abdollahi, & Solomon, 2008) showing that reminding participants of their parent after a mortality salience manipulation leads to lower accessibility of death-related words. Thus, Study 3 investigated whether activating the mental representation of a romantic partner (vs. an unknown other) following an upsetting memory recall would also reduce subsequent negative thinking in a stream of consciousness task (Kelly & Kahn, 1994).

Finally, Study 3 examined whether the magnitude of recovery elicited by simply viewing the photograph of one's romantic partner would predict mental and physical well-being. It has long been recognized that forming and maintaining close positive and supportive relationships confer protective health benefits (e.g., Diamond & Hicks, 2004; House et al., 1988; Ryff & Singer, 2001). One possible way through which attachment relationships contribute to health is by enhancing individuals' ability to cope with upsetting memories. Indeed, prior research suggests that asking people to relive negative autobiographical memories in the laboratory has long lasting effects, leading to increases in negative thinking and rumination and negative affect even seven days after the laboratory manipulation (Kross & Ayduk, 2008). Moreover, such rumination and negative thinking in daily life is associated with increased cardiovascular reactivity (Kross & Ayduk, 2008; Ottaviani, Shapiro, & Fitzgerald, 2011) and heightened susceptibility for developing various psychological disorders such as depression and generalized anxiety disorder (e.g., Brewin, 2007; Mathews & MacLeod, 2005; Nolen-Hoeksema et al., 2008) and physical disorders such as cardiovascular disease (e.g., Brosschot et al., 2006; Schwartz et

al., 2003). Thus, to the extent that the processes assessed in the laboratory using the AART reflect processes that occur in day-to-day life, individuals who obtain greater recovery effects from the mental representations of their romantic partner should also report better mental and physical health outcomes in daily life. In other words, it was predicted that individual differences in recovery from viewing one's partner's photograph would be prospectively associated with health problems in daily life, with individuals who show the greatest recovery effects in the lab subsequently experiencing fewer health problems.

## **Method**

**Participants.** Thirty heterosexual couples who were in a romantic relationship for at least one year (*range* = 12 to 132 months) participated in the study in exchange for monetary compensation. Given findings that “clear-cut” attachment behaviors develop in romantic relationships around a year or so (Zeifman & Hazan, 2008), couples were required to be together for at least one year. One couple was excluded from the sample because they withdrew from the study and one male participant was excluded because his memory cue was not displayed correctly due to an experimenter error, leaving 57 participants in the sample. The mean age of the final sample was 21 years ( $SD = 2.84$  years). The racial composition was 79% Caucasian, 18% Asian or Asian American, and 3% from other ethnic backgrounds.

**Procedure and materials.** *Overview.* The study consisted of three sessions. In session 1, participants generated upsetting autobiographical memories, and had their photographs taken.<sup>5</sup>

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<sup>5</sup> In session 1, participants also completed the short form of the Perceived Relationship Quality Components Inventory (Fletcher, Simpson, & Thomas, 2000; possible range = 1-7;  $M = 6.16$ ,  $SD = .65$  for females;  $M = 6.04$ ,  $SD = .64$  for males). Relationship quality did not significantly moderate the effect of prime on outcomes of interest.

Approximately one-week later participants returned to the lab for session 2 during which they completed the experimental task. Given the increased length of each AART trial due to the addition of the stream of consciousness task (Figure 2.1c), participants completed one trial in the partner block and one trial in the control block. Finally, approximately one to six months after completing the experimental task ( $M = 14$  weeks,  $SD = 8.43$  weeks), they completed the health outcome measures.<sup>6</sup> Couple members participated in the sessions independently.

**Materials.** All materials were the same as in Study 2 except for the procedures to obtain the photographs used as prime stimuli in the AART, the specific items of the implicit negative affect measure, and the stream of consciousness task.

*Prime manipulation.* Participants' photographs were taken at the lab, which offered greater control and standardization over the stimuli used as primes in the AART. Participants posed for a headshot in front of a white background, forward-facing the camera with a neutral expression. To create stimuli used in the AART, we paired couples and created yoked pairs between same-sex participants. Because each yoked pair saw the same faces (i.e., the photograph used as the partner prime for one participant was used as the control prime for the yoked participant), peculiarities in the stimuli were controlled entirely. The priming task was exactly the same as in Study 2.

*Implicit negative affect.* The implicit negative affect measure consisted of the adjectives used in Study 2 and the adjectives used in the original IPANAT (i.e., *tense, helpless, inhibited,*

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<sup>6</sup> Neither the main effect of time lag (i.e., time between completing the AART and completing the health problems measure) nor the time lag by recovery interaction was significantly associated with health problems.

*happy, energetic, and cheerful* with the latter three items reverse-scored). Given that the two measures were moderately to strongly correlated within each gender and priming condition (ranging from .43 to .74) and that the same pattern of findings emerged when they were analyzed separately, a composite implicit negative affect score was computed by averaging across all adjectives. Average Cronbach's alpha across the trials was .83. Participants completed the implicit negative affect measure once in each trial, after the last explicit affect rating.

*Stream of consciousness task.* After completing the implicit negative affect measure, participants completed a stream of consciousness task (Kelly & Kahn, 1994) as an index of the extent to which negative (vs. positive) thoughts were consciously available. They were asked to write down whatever information was present in their awareness from moment to moment for five minutes. Their transcripts were analyzed using the Linguistic Inquiry and Word Count software (LIWC2007; Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007). LIWC analyzes transcripts with a dictionary-based approach in which each word is coded on various linguistic dimensions. Transcripts were coded for the presence of positive affect and negative affect words. Following Pennebaker, Mayne, and Francis (1997), we computed an affect difference score by subtracting the percentage of positive affect words used in the stream of consciousness task from the percentage of negative affect words. Thus, higher scores indicate greater use of negative relative to positive affect words (referred to hereafter simply as *negative thinking*).

*Health problems.* Thirty-nine (21 women) of the 57 participants (68%) agreed to complete the health problems measures. Both members of fourteen couples completed the measures. For the remaining couples, only one or neither of the members agreed to complete the measures. One couple reported that they had broken up and consequently were excluded from the analyses reducing the sample size for health problem analyses to 37. This final sample did

not differ from the remainder of the sample on attachment style to their partner or the affective recovery in the partner condition as assessed by post-prime  $NA_{\Delta}$ ,  $ps > .34$ .

The health problem questions were adapted from previous health status inventories (e.g., Veit & Ware, 1983). Participants indicated how many times within the last month they visited a doctor or other health professional for a physical or emotional health concern ( $M = 2.00$ ,  $SD = 3.28$ ) and how many days within the last month they missed school or work due to a health problem ( $M = .76$ ,  $SD = 1.23$ ). They also indicated whether they currently had any of a total of 14 physical (e.g., persistent pain) or psychological (e.g., persistent anxiety) symptoms ( $M = 1$ ,  $SD = .91$ ). Finally, they rated the extent to which physical health or emotional problems interfered with their school/work life or other daily activities (3 items; 1 = *All of the time* to 5 = *None of the time*; e.g., “*Cut down on the amount of time you spent on work or other activities*”- reverse scored;  $M = 3.77$ ,  $SD = .92$ ) and social activities with family, friends, neighbors, and groups (1 item; 1 = *Not at all* to 5 = *Extremely*;  $M = 1.59$ ,  $SD = .72$ ) within the last month. All variables except days missed at school or work had a loading of at least .40 on a primary health problems factor. Therefore, a composite health problems score was computed by standardizing and averaging the remaining variables (i.e., number of doctor visits, symptoms, interference with work/school, and interference with social life;  $\alpha = .81$ ).<sup>7</sup>

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<sup>7</sup> Participants also completed a two-item measure assessing how they perceive their overall mental and physical health in the last month (1 = *Poor* to 5 = *Excellent*). Analyses showed that the perceived health score was not significantly correlated with the health problems score ( $r = -.29$ ,  $p = .085$ ). Thus, we did not include the perceived health measure in the analyses.

**Data analytic strategy.** To account for the interdependency among data points due to participants being nested within couples and couples being nested in yoked pairs, linear mixed models (LMM) were performed in SPSS. First, to test whether the upsetting memory recall induced negative affect, an LMM was performed with explicit post-memory  $NA_{\Delta}$  as the dependent variable, and couple and yoked couple pair as random variables. In this analysis, the intercept of the equation corresponds to mean post-memory  $NA_{\Delta}$  and thus, a test of whether the intercept is significantly different than zero addresses the question of whether the memory recall induced negative affect. Next, to test for the presence of recovery effects, an LMM was performed for each of the main dependent variables, including explicit negative affect (i.e., explicit post-prime  $NA_{\Delta}$ ), implicit negative affect, and negative thinking. In each of these models, prime (0 = control, 1 = partner), gender (0 = female, 1 = male), and prime by gender interaction were entered as fixed variables, and couple and yoked couple pair were entered as random variables. Unless otherwise noted, gender or gender by prime interaction did not reach conventional levels of statistical significance ( $p < .05$ ). The variance component for the yoked couple pair was estimated to be zero for implicit negative affect and negative thinking, and .002 ( $p = .97$ ) for explicit negative affect. Hence, this variable was dropped from the final models.

Finally, to test whether the magnitude of recovery in the partner condition predicts subsequent health problems, an LMM was performed with health problems as the outcome variable, post-prime  $NA_{\Delta}$  in the partner condition as the predictor of interest, and couple as the random variable. Because attachment dimensions and gender have been shown to predict health outcomes (e.g., Kafetsios & Sideridis, 2006; Kiecolt-Glaser & Newton, 2001), these variables were included as covariates in the model.

There is no established method of calculating effect sizes for complex non-independent designs such as the LMMs used in the present study (Klein, 2004). However, to give the reader a general sense of the magnitude of the effect of the prime on outcomes of interest, we calculated the effect size in units of residual variation, estimated by the full model (see Günaydin et al., 2012). Our estimate of effect size is equivalent to Cohen's  $d$ , except that we used the residual standard deviation. Specifically, we estimated the effect size using the following formula:  $d = (\text{Estimated mean}_{(\text{partner})} - \text{Estimated mean}_{(\text{control})}) / \text{SD}_{\text{res}}$  where  $\text{SD}_{\text{res}}$  is the residual standard deviation—i.e. the square root of the error variance.

## Results and Discussion

**Effect of memory recall on negative affect.** Consistent with Studies 1 and 2, the upsetting memory recall induced negative affect as reflected by a mean post-memory  $\text{NA}_{\Delta}$  score significantly above zero ( $M = 1.06$ ,  $t(28.31) = 7.86$ ,  $p < .001$ ,  $d = 1.08$ ).<sup>8</sup> Moreover, participants reported greater negative affect in response to the memory recall in the first block of the AART than the second block ( $p < .001$ ). Nevertheless, recalling the same upsetting memory the second time still induced negative affect ( $M = .74$ ,  $t(28.24) = 5.85$ ,  $p < .001$ ,  $d = .83$ ).

**Effect of prime on distraction.** As in Study 2, there was no evidence that the attachment figure prime was more distracting than the control prime as measured by the latency to locate unrelated stimuli during the priming task ( $M = 381.13$ ,  $SE = 9.93$  vs.  $M = 383.81$ ,  $SE = 9.92$ ;  $F(1, 82.42) = .05$ ,  $p = .82$ ,  $d = .04$ ).

**Recovery hypothesis.** Supporting the recovery hypothesis, viewing the photograph of one's romantic partner (vs. a yoked participant's romantic partner) after recalling an upsetting

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<sup>8</sup> SPSS's linear mixed models uses Satterthwaite's (1946) approximation to estimate the degrees of freedom ( $df$ ) associated with the intercept and slopes, resulting in non-integer  $dfs$ .

memory enhanced recovery from the memory recall as reflected by lower post-prime  $NA_{\Delta}$  ( $F(1, 82.69) = 41.52, p < .001, d = 1.21$ ; see Table 2.1). The prime interacted with gender as well ( $F(1, 82.69) = 7.90, p = .006$ ). Planned comparisons focusing on the effect of prime type for each gender separately revealed that viewing the partner's photograph (vs. the control photograph) enhanced recovery for men ( $M = -.05, SE = .18$  vs.  $M = .59, SE = .18; d = .68$ ) and women ( $M = -.64, SE = .18$  vs.  $M = 1.00, SE = .18; d = 1.73$ ). However, the partner prime led to lower post-prime  $NA_{\Delta}$  for women than men,  $p = .02$ . Viewing the photograph of the partner (vs. yoked participant's partner) also led to lower implicit negative affect ( $F(1, 110) = 2.79, p = .098, d = .31$ ; see Table 2.1), although this effect was not statistically significant at the conventional two-sided  $p < .05$ .<sup>9</sup>

**Table 2.1.** Mean Explicit and Implicit Negative Affect, and Negative Thinking as a Function of Prime (Partner vs. Control) in Study 3

| Measure                  | Condition   |             |
|--------------------------|-------------|-------------|
|                          | Partner     | Control     |
| Explicit negative affect | -.35 (.13)  | .80 (.13)   |
| Implicit negative affect | 2.28 (.07)  | 2.45 (.07)  |
| Negative thinking        | -2.77 (.34) | -1.51 (.34) |

*Note.* Standard errors are in parentheses. Explicit negative affect was computed by subtracting baseline negative affect from post-prime negative affect. Negative thinking was computed by subtracting percentage of positive affect words from percentage of negative affect words. For all three measures, higher scores indicate greater negative outcomes.

<sup>9</sup> The *df* for mean implicit negative affect were larger than *df* for explicit negative affect because for implicit negative affect, the variance component for the couple variable was estimated to be zero and hence, dropped from the model.



**Negative thinking.** After recalling an upsetting memory, participants showed lower negative thinking in the stream of consciousness task after viewing the photograph of one's romantic partner compared to viewing the photograph of a yoked participant's partner ( $F(1, 82.66) = 7.59, p = .007, d = .52$ ; see Table 2.1).

**Health problems.** Individuals who experienced greater recovery in negative affect in response to viewing their partner's photograph following an upsetting memory recall reported fewer psychological and physical health problems,  $b = .26, SE = .12, p = .03$ . The effects of gender, attachment anxiety, or avoidance were not statistically significant ( $ps \geq .10$ ).<sup>10</sup> The magnitude of recovery in the control condition was not significantly associated with health problems,  $b = .09, SE = .10, p = .40$ , indicating that the health benefits observed in the partner condition were not simply due to individual differences in the ability to recover from negative affect but due to differences in the effect of partner representations in enhancing recovery.

Overall, Study 3 provided further support for the recovery hypothesis by extending the findings of Studies 1 and 2 to romantic partners. Study 3 also enabled to test for gender differences in the recovery effect. For explicit affect, although viewing the photograph of the romantic partner enhanced recovery among both men and women, the partner photograph led to greater recovery for women than men. This finding is in line with research showing that women, compared to men, are more sensitive to facial (e.g., McBain, Norton, & Chen, 2009) and relational cues (e.g., Cross & Madson, 1997). Nevertheless, this gender difference should be interpreted cautiously given that there was not support for a similar gender difference with the implicit affect measure. In addition, Study 3 showed, for the first time, that activating the

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<sup>10</sup> When covariates were removed from the model, the results were highly similar, although not significant at  $p < .05$  ( $b = .16, SE = .11, p = .14$ ).

romantic partner representation after an upsetting memory recall led to lower negative thinking and that greater decreases in negative affect in response to viewing the photograph of the partner prospectively predicted experiencing fewer psychological and physical health problems.

#### **Study 4**

Adult attachment style is expected to relate to the ability of individuals to obtain affect and distress regulation benefits from attachment figures. Thus, Study 4 examined whether the psychological benefits of activating the mental representation of an attachment figure vary as a function of a person's attachment style. Because the statistical power for each of the individual studies to test the interaction between the manipulated variable (prime) and non-manipulated variable (attachment style) was low (and much lower than the statistical power to test each main effect; see Smith, 2000), a meta-analysis was conducted on the combined data from Studies 1 through 3. This approach increased the power of the tests and hence provided more reliable estimates of the association between attachment style and the magnitude of recovery effects elicited by the mental representation of an attachment figure.

#### **Method**

**Materials.** *Adult attachment style.* In all three studies, participants completed a 10-item short version of the Experiences in Close Relationships Inventory-Revised (ECR-R; Fraley, Waller, & Brennan, 2000) developed and validated by Zayas, Mischel, Shoda, and Aber (2011). Participants completed the measure either as part of the online survey (Studies 1 and 2) or at the first laboratory session (Study 3). They were instructed to respond to the items in terms of their relationship with their mother in Studies 1 and 2 and romantic partner in Study 3, and accordingly, the items were modified so that they were appropriate for the particular attachment relationship. Participants responded to five items assessing attachment anxiety (e.g., “*I often*

worry that my mother (partner) does not really love me”) and five items assessing attachment avoidance (e.g., “I find it difficult to allow myself to depend on my mother (partner)” on a 7-point Likert scale (1 = *Strongly Disagree* to 7 = *Strongly Agree*). The scales showed strong internal reliability (see Table 2.2 for  $\alpha$ s). Anxiety and avoidance scales were positively correlated ( $r$ s ranged from .32 to .68,  $p$ s < .02), in line with previous studies (e.g., Zayas et al., 2011).

**Data analytic strategy.** To obtain effect sizes for each study, we first computed the difference in negative affect between the prime conditions. For explicit negative affect, post-prime  $NA_{\Delta}$  in the attachment figure (mother in Studies 1 and 2 and partner in Study 3) condition was subtracted from post-prime  $NA_{\Delta}$  in the control condition. Thus, higher difference scores reflect greater recovery benefits conferred by the mental representation of the attachment figure compared to the control condition. Similarly, for implicit negative affect, negative affect in the attachment figure condition was subtracted from negative affect in the control condition. Next, for Studies 1 and 2, the correlations between these difference scores and attachment dimensions were computed. Given the nested structure of the data in Study 3, the effect size was estimated by performing two LMMs, one for each attachment dimension, with the standardized difference scores as the dependent variable, standardized attachment anxiety or avoidance score as the fixed factor, and couple as the random factor. By standardizing all variables before entering them into the LMMs, the coefficients produced by the model are akin to standardized coefficients and comparable to the zero-order correlation coefficients computed in Studies 1 and 2. Next, all effect sizes were transformed to  $z$  scores using Fisher’s  $r$ -to- $z$  transformation (Field, 2001; Lipsey & Wilson, 2001; see Table 2.2 for the transformed effect sizes within each study). Finally, the transformed effect sizes were weighted as a function of the accuracy of the effect size (based on the sample size) and mean effect sizes were estimated using random effects

models (Rosenthal & DiMatteo, 2001). Preliminary analyses revealed that in none of the individual studies the two-way interaction between attachment anxiety and avoidance was appreciably associated with the magnitude of the recovery effect ( $ps > .17$ ). Therefore, this two-way interaction term was not included in the meta-analyses.

## Results and Discussion

As predicted by attachment theory, the meta-analysis revealed that individuals high on attachment avoidance showed less affective recovery as a result of priming the mental representation of an attachment figure. This inverse association between avoidance and affective recovery was observed for both the explicit (mean effect size =  $-.18$ ,  $p = .02$ , 95% C.I. =  $[-.32, -.03]$ ) and implicit affect measure (mean effect size =  $-.20$ ,  $p = .03$ , 95% C.I. =  $[-.38, -.02]$ ) and it was evident in all studies included in the meta-analyses (Studies 1-3 for explicit affect, and Studies 2 and 3 for implicit affect; see Table 2.2).

With respect to the association between attachment anxiety and the magnitude of recovery effects, the mean effect sizes did not reach statistical significance (mean effect size =  $-.10$  for explicit and  $-.20$  for implicit negative affect,  $ps > .20$ ). *Post hoc*, a meta-analysis on the combined data from Studies 1 and 2, focusing on representations of one's mother, showed a trend in which higher attachment anxiety toward one's mother was associated with smaller recovery effects (mean effect size =  $-.16$ ,  $p = .09$ , 95% C.I. =  $(-.34, .02)$ ). This negative association between attachment anxiety and recovery effect was most clearly evident for implicit negative affect assessed in Study 2.<sup>11</sup>

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<sup>11</sup> Meta-analyses were performed to also test whether attachment style was associated with explicit negative affect in the buffering condition (Studies 1 and 2). No significant associations were found, all  $ps > .13$ .

**Table 2.2.** Effect Sizes (*r*) Representing the Associations between Each Attachment Dimension and Recovery Effects for Studies 1-3.

|         | Attachment avoidance |          |           |          |                                  |                                  | Attachment anxiety |           |          |                                  |                                  |
|---------|----------------------|----------|-----------|----------|----------------------------------|----------------------------------|--------------------|-----------|----------|----------------------------------|----------------------------------|
|         | <i>n</i>             | <i>M</i> | <i>SD</i> | <i>A</i> | <i>Effect size (explicit NA)</i> | <i>Effect size (implicit NA)</i> | <i>M</i>           | <i>SD</i> | <i>α</i> | <i>Effect size (explicit NA)</i> | <i>Effect size (implicit NA)</i> |
| Study 1 | 55                   | 3.12     | 1.43      | .86      | -.17                             | -                                | 1.88               | 1.07      | .85      | -.14                             | -                                |
| Study 2 | 70                   | 2.91     | 1.41      | .88      | -.21                             | -.27                             | 1.84               | 1.06      | .83      | -.17                             | -.41                             |
| Study 3 | 57                   | 2.26     | 1.02      | .76      | -.13                             | -.15                             | 2.32               | 1.02      | .74      | .03                              | .04                              |

*Note.* Effect sizes refer to Fisher’s r-to-z transformed correlations between attachment dimensions and the magnitude of recovery effect within each study. For explicit affect, recovery effects were computed by subtracting post-prime NA<sub>Δ</sub> in the attachment figure condition from post-prime NA<sub>Δ</sub> in the control condition. For implicit affect, recovery effects were computed by subtracting implicit negative affect in the attachment figure condition from implicit negative affect in the control condition.

## General Discussion

The inability to effectively regulate negative affect triggered by thinking about distressing experiences has been linked with a variety of emotional and physical health disturbances. Although a growing body of research indicates that attachment figures dampen psychological and physiological distress in response to external stressors, extant research has not examined whether attachment relationships similarly help people cope with internally generated distress. The current research demonstrates, for the first time, that activating the mental representation of an attachment figure enhances affective recovery following an upsetting autobiographical memory recall. Across three studies, simply imagining a supportive interaction with, or viewing a photograph of, an attachment figure (vs. an acquaintance or a stranger) after recalling an upsetting memory enhanced recovery. Affective recovery was reflected by lower negative affect assessed by explicit measures of phenomenological experience as well as implicit measures of affect that are less susceptible to self-presentation biases, and by lower negative thinking in a stream of consciousness task.

Moreover, individual differences in attachment avoidance (but not attachment anxiety) were associated with less affective recovery effects as observed on both the explicit and implicit affect measures. Given that the meta-analysis afforded high statistical power (e.g., power was .99 to detect a medium-sized association of .3), the findings suggest that if anxiety is associated with affect regulation, the effect is small, and a larger  $N$  would be required to empirically detect it. Overall, these findings are highly consistent with the proposition that individuals with an avoidant attachment style possess mental representations of attachment figures that are less positive (e.g., Baldwin et al., 1993; Zayas & Shoda, 2005) and obtain less regulatory benefits from physical contact with attachment figures in stressful situations (e.g., Carpenter &

Kirkpatrick, 1996; Coan, 2008). They are also consistent with the idea that attachment avoidance and anxiety are related to affect dysregulation in different ways. Whereas avoidance is more likely to modulate the affect regulation benefits of attachment figures in stressful contexts, anxiety is more likely to modulate affective responses to separation from attachment figures (e.g., Diamond et al., 2008).

Most important, individuals who experienced the greatest recovery after being primed with their romantic partner in the AART subsequently experienced fewer psychological and physical health problems. Most of the work investigating attachment-induced regulation in laboratory tasks has not linked individual differences in these effects to emotional or physical well-being. Thus, the present finding is novel in being the first to show links between a computer-based laboratory task (the AART) designed to assess recovery effects triggered by simply viewing a photograph of one's partner, on the one hand, and reports of actual psychological and physical ailments, on the other.

### **Implications for Adult Attachment**

Attachment theory (e.g., Bowlby, 1982; Mikulincer & Shaver, 2007a) predicts that attachment figures enhance regulation of negative affect triggered by *both* external and internal stressors. Yet, experimental work has exclusively focused on external stressors. In light of findings from the emotion regulation literature indicating important differences in the regulation of internal (vs. external) stressors (McRae et al., 2012; Ochsner et al., 2009), it is unwarranted to assume that the regulatory benefits of attachment figures would extend to internal stressors. The present work provides the first empirical support for the hypothesis that simply calling to mind an attachment figure is sufficient to reproduce regulatory benefits in response to an internal stressor, thereby addressing an important gap in the attachment literature.

Moreover, the current research has implications for identifying a social cognitive mechanism for the well documented link between supportive, positive interactions with close others and positive health outcomes in daily life (e.g., Barth, Schneider, & von Kanel, 2010; Diamond & Hicks, 2004; House et al., 1988). The inability to regulate one's affect in response to upsetting memories has been implicated in the development of rumination and various psychological and physical disorders (e.g., Brosschot et al., 2006; Mathews & MacLeod, 2005; Nolen-Hoeksema et al., 2008; Schwartz et al., 2003). Not surprisingly then, is the finding that individual differences in the ability to obtain regulatory benefits from activating the attachment figure mental representation predicted emotional and physical health at least one month after the experiment. In sum, the present findings aid in understanding the protective health benefits of attachment relationships. Nonetheless, because the current prospective evidence does not show causality, future experimental work building on the present findings is needed.

An important question regarding the generalizability of the current findings is whether the attachment-induced recovery effects are simply due to mental representations of attachment figures being more positive, compared to representations of acquaintances or unknown others. Research shows that mental representations of attachment figures are heavily imbued with positivity (Zayas & Shoda, 2005) and are highly rewarding (Acevedo, Aron, Fisher, & Brown, in press). Nonetheless, based on the present findings, as well as drawing from past research and theorizing, we believe that the present findings are due to activating attachment representations, rather than simply positivity. Across all three studies, the magnitude of the affect regulation benefits triggered by the attachment figure representation was meaningfully related to adult attachment avoidance within the *specific* attachment relationship. If the attachment-induced



affect regulation benefits were entirely reflecting positivity, the specific associations with avoidance to the attachment figure would not have been observed.

Moreover, our interpretation is consistent with past theory and research. A body of research across various subdisciplines within psychology using both nonhuman animals and humans (e.g., see Hennessy et al., 2009; Sbarra & Hazan, 2008, for reviews) points to the affect regulation benefits of attachment figures. For example, in the social cognitive literature, research by Mikulincer and colleagues (Mikulincer et al., 2001) has shown that in stressful contexts exposure to attachment security-related representations restores positive affect, whereas positive, nonattachment stimuli (e.g., a smiling face) do not. In studies investigating the physiological correlates of daily interactions, time spent with romantic partners is associated with down-regulation of the autonomic nervous system and hypothalamic-pituitary-adrenocortical axis activity (e.g., Gump, Polk, Kamarck, & Shiffman, 2001). In the social cognitive neuroscience literature, recent work suggests that interactions with attachment figures are likely to activate oxytocin and opioid neurotransmission (e.g., Coan, 2008; Eisenberger et al., 2011), which is also known to reduce stress reactivity. Critically, such neurophysiological responses are assumed to be easily conditioned to cues associated with the attachment figure (e.g., Depue & Morrone-Strupinsky, 2005; Uvnäs-Moberg, 1998).

Collectively, the present as well as prior findings and theorizing support the conclusion that the regulatory benefits associated with attachment figures are not merely due to positivity. Nonetheless, given research showing that individuals form attachments to inanimate objects (e.g., Van Ijzendoorn, Goosen, Tavecchio, Vergeer, & Hubbard, 1983), it would be informative to investigate to what extent other stimuli would also facilitate recovery from negative memories.

## Implications for Emotion Regulation

Although the present studies were based on an adult attachment perspective, they also inform the emotion regulation literature in two important ways. First, previous research on affect regulation in response to negative memories has focused on effortful strategies such as reflecting on the event from a self-distanced or observer perspective (Kross & Ayduk, 2011) or reappraising an emotional experience (Gross, 1998). The current findings offer a novel route to facilitating affect regulation in response to an internally generated stressor. That is, simply being reminded of an attachment figure enhanced affect regulation in a fairly effortless, automatic, and spontaneous fashion. As such, this type of affect regulation may be particularly useful for individuals with difficulty in implementing effortful strategies.

Second, some research (e.g., Gross, 1998, 2001) suggests that antecedent-focused strategies, which are implemented preemptively *before* the emotional response is fully developed, are more effective than response-focused strategies, which are implemented *after* an emotional response is fully developed and more intense (Sheppes & Gross, 2011; Sheppes & Meiran, 2007). The present work shows that this may not always be the case. In some situations, such as when the stressor is internally generated, activating the mental representation of an attachment figure can facilitate recovery *after* (but not *before*) affect has been generated. These findings are consistent with theory and research in emotion regulation showing that a relatively less effortful, more automatic process—such as activating attachment representations by simply viewing the photograph of a loved one—has a greater chance to down-regulate negative affect after the emotion has been activated (see also Sheppes & Meiran, 2007). As such, the current findings complement the existing work by Gross and colleagues suggesting a process that can be implemented after an emotional response is fully developed. This is important because in daily

life people do not always get a chance to regulate their emotions early on as they experience an emotional event but often times they need to modulate their responses after an emotion is experienced (Gross, Richards, & John, 2006).

### **The Role of Buffering**

One of the aims of the present work was to investigate whether the timing of activating the mental representation of an adult attachment figure affected the ability to regulate negative affect. Whereas activating the attachment figure representation *after* recalling an upsetting memory consistently led to enhanced affective recovery, activating the mental representation of an attachment figure *before* recalling an upsetting memory did not appreciably buffer against negative affect. Thus, at least with respect to regulating affect triggered by an internally generated stressor, the timing of activation appears to be crucially important.

One possible reason for the lack of a buffering effect in the present work is that in daily life buffering effects may be manifested in terms of the *frequency* and *manner* with which individuals recall upsetting memories, rather than in lessening the intensity of affective response when the memory is fully relived. That is, in daily life, activating the mental representation of an attachment figure may buffer individuals by minimizing the tendency to recall upsetting memories in the first place. A related possibility is that, when recalled spontaneously in day-to-day life, attachment figure representations may influence *how* individuals reflect on these events, perhaps affecting whether they adopt a more adaptive perspective (e.g., a self-distanced perspective instead of an immersed perspective; e.g., Kross & Ayduk, 2011).

The present work does not address these possibilities because all participants were explicitly instructed to deeply focus on their feelings and thoughts about the past event. Thus, the frequency of recall was completely controlled. Moreover, the upsetting memory recall task was a

very powerful and mentally engaging stressor, thereby reducing potential variation in how individuals may spontaneously reflect on these events. Indeed, affective and cognitive responses to such strong situational cues are difficult to modulate (Meyer & Dalal, 2009), whereas responses to weaker situational cues are influenced by subtle manipulations of temporary mental states as well as chronic individual differences in reappraisal and other strategies. Future work might investigate whether activating the mental representation of an attachment figure would reduce the tendency to think of an upsetting memory and influence the manner in which the memory is recalled.

### **General Summary and Conclusions**

The present research investigated whether mental representations of attachment figures help individuals regulate affect in response to an internally generated stressor such as reliving an upsetting autobiographical memory. Specifically, activating the mental representation of an attachment figure, whether it is one's mother or one's partner, by either thinking about a supportive interaction with or simply viewing a photograph of them helps individuals restore affect to levels experienced prior to the upsetting memory recall, and decreases the tendency to engage in negative thinking. These psychological processes captured in the laboratory with the AART, an experimental task designed to assess attachment-related regulation, also appears to be at play in individuals' day-to-day lives. Those individuals who showed the greatest affective recovery were also the ones who reported fewer psychological and physical health problems. Finally, attachment avoidance was associated with weaker recovery effects. Collectively, these findings are the first to document the effect of attachment figures on enhancing recovery following internally generated stressors as well as the short- (i.e., reducing negative thinking) and long-term (i.e., protecting against health problems) consequences of these effects.

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## CHAPTER 3

### **Perceived Partner Responsiveness Moderates the Association between Received Emotional Support and All-Cause Mortality**

Although *perceived* availability of emotional support is consistently associated with lower risk for mortality (e.g., Berkman, Leo-Summers, & Horwitz, 1992; Orth-Gomér, Rosengren, & Wilhelmsen, 1993), prior evidence for associations between *received* emotional support and mortality risk has been mixed, with some studies reporting a decrease in mortality risk (e.g., Penninx, van Tilburg, Kriegsman, Deeg, Boeke, & van Eijk, 1997), and others reporting no association (e.g., Thong, Kaptein, Krediet, Boeschoten, & Dekker, 2007) or an increase in mortality risk (e.g., Krause, 1997).

These mixed findings suggest that there may be moderating factors influencing the association between received emotional support and mortality (Uchino, 2009). In this article, we examine the potential moderating role of perceived partner responsiveness (PPR). PPR reflects the extent to which individuals believe their relationship partners understand, validate, and care for them (Reis, 2007). PPR is conceptually distinct from received support from a partner. Whereas the latter construct refers to the quantity of actual support receipt within a specific time frame, the former reflects a global view of one's partner as understanding, validating, and caring. For instance, a partner who provides high emotional support may be perceived as high or low on PPR. Thus, PPR is critical to understanding the association between received support and health outcomes.

The seemingly paradoxical negative associations between received support and health have been attributed to potential costs associated with receiving support: Supportive behavior may fail to match the needs of the support recipient or may threaten the recipient's sense of self-



efficacy and independence, thereby further increasing distress (e.g., Bolger & Amarel, 2007; Rafaeli & Gleason, 2009). High PPR appears to reduce these potential costs. Partners who are perceived as high in responsiveness are more likely to engage in support behaviors that are appropriately contingent on their partner's needs (Collins, Guichard, Ford, & Feeney, 2006). Moreover, support received from a responsive partner is associated with increased levels of self-efficacy, autonomy, and independent goal pursuit on the part of the support recipient (Feeney, 2007). Finally, high PPR in daily support interactions is associated with lower daily negative affect (Maisel & Gable, 2009). Given these findings, we predicted that high PPR would attenuate the association between high received emotional support and increased mortality.

To test whether PPR moderates the association between mortality risk and received partner emotional support (RPES), we used data from the National Survey of Midlife Development in the United States (MIDUS), a panel survey designed to assess age-related changes in physical and mental health of adults between the ages of 25 and 74 (Brim, Baltes, Bumpass, Cleary, Featherman, Hazzard et al., 2007). In order to investigate the unique and combined influences of PPR and RPES on all-cause mortality risk, we tested two models that included a wide range of covariates. In the first model, we examined whether the interaction between RPES and PPR was associated with mortality risk after adjusting for demographic factors (age, gender, ethnicity, education level, and annual household income) and physical health status. Based on prior research on the mechanisms linking romantic relationships to physical health outcomes (e.g., Kiecolt-Glaser & Newton, 2001), we then included health behaviors, psychological symptoms, and personality traits as additional covariates.

## Method

### Sample

The MIDUS national sample consists of 3,487 individuals who were invited to complete a phone interview and then a self-administered survey in 1995-1996. Of the 2,035 individuals who were married or cohabiting and completed both the phone interview and the self-administered questionnaire, 1,803 had complete data on all variables of interest. Missing data were no more than 4% on any of these variables. We performed all the analyses using both the original data ( $n = 1,803$ ) and the complete data ( $n = 2,035$ ) after estimating missing values using multiple imputation. The analyses using multiple imputation produced similar results to those obtained using the original data. Therefore, we present all findings using the original data. Of the participants in the final sample, 46% were female and 54% were male; 91% were Caucasian, 4% were African-American, 1% Asian, 1% Native American, and 3% were from other ethnic backgrounds; 39% graduated from high school or less and 61% had some college education or more. The mean age of participants was 46.53 ( $SD = 12.70$ ).

### Measures

**Mortality status.** Names of individuals who could not be contacted for a 10-year follow-up assessment were submitted to the National Death Index through 2004. One hundred and two out of 1,803 individuals were identified as deceased.

**Received partner emotional support (RPES).** *RPES* was measured with a single item asking how many hours per month participants receive emotional support (e.g., getting comfort, having someone listen to them) from their spouse or romantic partner. Given its high skewness (6.33), this variable was log-transformed prior to the analyses. Replicating previous work (e.g., Bolger, Zuckerman, & Kessler, 2000), high *RPES* was associated with lower psychological well-

being ( $r = .06, p < .05$ , for depression;  $r = .06, p < .01$ , for generalized anxiety disorder;  $r = .05, p < .05$ , for neuroticism).

**Perceived partner responsiveness (PPR).** For the present study, we created a *PPR* score using three items in the MIDUS self-administered questionnaire (revised from Schuster, Kessler, & Aseltine, 1990). The items asked participants to indicate how much their spouse or partner cares about them, understands the way they feel about things, and appreciates them. The items matched the three components of PPR (i.e., understanding, validating, and caring) identified in the literature (Reis, 2007). Moreover, the content and wording of the items were similar to those of a short PPR measure used in a recent study (Maisel & Gable, 2009). Participants responded to the items on a 4-point scale (1 = *A lot* to 4 = *Not at all*;  $\alpha = .84$ ). Responses were reverse-scored so that higher scores reflected greater PPR. In the current sample, PPR and RPES scores were moderately correlated ( $r = .28, p < .001$ ).

**Physical health status.** Physical health variables used in the present study included participants' perception of their physical health (1 = *Poor* to 5 = *Excellent*), self-reported cardiovascular problems (0 = *No*, 1 = *Yes*) and cancer (0 = *No*, 1 = *Yes*); and the sum of remaining chronic physical health symptoms (range = 0-22).

**Health behaviors.** Participants indicated the amount of effort they put on maintaining their health (0 = *None* to 10 *Very much*) and the quality of their sleep (i.e., how frequently they experience sleeping problems; 1 = *Almost every day* to 6 = *Not at all*). In addition, participants completed a five-item modified version of the Michigan Alcohol Screening Test (Selzer, 1971). The test assesses whether participants experienced any alcohol-related problems during the past year (0 = *No*, 1 = *Yes*). The responses were summed ( $\alpha = .62$ ) and then dichotomized (0 = No alcohol problems, 1 = Otherwise).

**Psychological symptoms.** Psychological symptoms were assessed with the depression (0 = *Lowest* to 7 = *Highest*) and generalized anxiety disorder (0 = *Lowest* to 10 = *Highest*) scales of the Composite International Diagnostic Interview-Short Form (Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998).

**Personality.** Five major personality traits were measured using the Midlife Development Inventory (MIDI) Personality Scales, a 25-item adjective list specifically designed for the MIDUS project (Lachman & Weaver, 1997). The adjectives were mostly selected from existing personality inventories (e.g., John, 1990) and pilot tested with a separate probability sample of 1000 men and women between the ages of 30 and 70. Participants were asked to indicate how much each adjective described them (1 = *A lot* to 4 = *Not at all*). Responses were reverse-scored so that higher scores reflected higher standing on each trait. Cronbach's alphas in the current sample were .79 for extraversion (outgoing, friendly, lively, active, talkative), .75 for neuroticism (moody, worrying, nervous, calm), .80 for agreeableness (helpful, warm, caring, softhearted, and sympathetic), .57 for conscientiousness (organized, responsible, hardworking, careless), and .77 for openness to experience (creative, imaginative, intelligent, curious, broad-minded, sophisticated, adventurous). The MIDI scales have been found to be associated with psychological and physical well-being in theoretically meaningful ways (e.g., Keyes, Shmotkin, & Ryff, 2002; Turiano, Pitzer, Armour, Karlamangla, Ryff, & Mroczek, 2012), providing evidence for their construct validity. Moreover, the scales show strong measurement invariance across adult age groups (Zimprich, Allemand, & Lachman, 2012).

### **Data Analytic Strategy**

We conducted hierarchical logistic regression analyses to predict mortality risk. Specifically, two models were tested. Model 1 included only demographic factors and physical

health status variables as covariates. Demographic factors were entered in Step 1; physical health status variables were entered in Step 2; RPES and PPR were entered in Step 3; and the two-way interaction between RPES and PPR was entered in Step 4. Model 2 examined the extent to which the association between mortality and RPES by PPR interaction was explained by any of the pathways (i.e., health behaviors, psychological symptoms, and personality traits) linking romantic relationships to health outcomes (e.g., Kiecolt-Glaser & Newton, 2001). Specifically, in Model 2, demographic factors were entered in Step 1; physical health status variables were entered in Step 2; health behaviors were entered in Step 3; psychological symptoms were entered in Step 4; personality traits were entered in Step 5; RPES and PPR were entered in Step 6; and the two-way interaction between RPES and PPR was entered in Step 7. All continuous variables were standardized before being entered into the models.

## Results

Table 3.1 shows the regression coefficients, odds ratios, 95% confidence intervals for odds ratios, and Nagelkerke's  $R^2$ s for the final step of Models 1 and 2. Including demographic factors significantly improved the null model ( $\chi^2(5) = 143.17, p < .001$ ). Being older and male predicted increased mortality risk. Physical health status significantly improved the model as well ( $\chi^2(4) = 53.28, p < .001$ ) with being in poor perceived health and having a cardiovascular problem predicting increased mortality risk. Adjusting for health behaviors, psychological symptoms, and personality traits in Model 2 did not significantly improve the model ( $\chi^2s < 4.47, ps > .48$ ). Similarly, adding the main effects of RPES and PPR did not improve the models either (Model 1:  $\chi^2(2) = 3.97, p = .14$ ; Model 2:  $\chi^2(2) = 2.87, p = .24$ ). However, as predicted and shown in Table 3.1, RPES by PPR interaction significantly predicted all-cause mortality in both Models 1 and 2 (Model 1:  $\chi^2(1) = 4.63, p = .031$ ; Model 2:  $\chi^2(1) = 4.94, p = .026$ ).

To probe the interaction, we conducted region of significance analyses (Hayes & Matthes, 2009) using the full set of covariates. Adjusted for demographic factors, physical health status, health behaviors, psychological symptoms, and personality traits, high RPES was associated with an increase in all-cause mortality risk for values of PPR below 1.91 (odds ratios  $> 1.70$ ,  $ps < .05$ ), but was unrelated to mortality risk for values of PPR above 1.91, suggesting that high PPR eliminates the association between high RPES and increased mortality.

Given prior research showing that health effects of romantic relationships may differ between men and women (e.g., Kiecolt-Glaser & Newton, 2001), supplementary analyses tested whether the three-way interaction term between RPES, PPR, and gender was associated with mortality risk. In neither of the models was the three-way interaction term significantly associated with mortality risk (Model 1:  $B = .21$ ,  $SE = .26$ ,  $p = .42$ ; Model 2:  $B = .25$ ,  $SE = .26$ ,  $p = .33$ ).

**Table 3.1.** Descriptive Statistics and Hierarchical Logistic Regression Models Predicting All-Cause Mortality

|                             | <i>M</i>                           | <i>SD</i> | Model 1  |              |              |                  | Model 2  |              |              |                  |
|-----------------------------|------------------------------------|-----------|----------|--------------|--------------|------------------|----------|--------------|--------------|------------------|
|                             |                                    |           | <i>B</i> | <i>S. E.</i> | <i>O. R.</i> | 95% <i>C. I.</i> | <i>B</i> | <i>S. E.</i> | <i>O. R.</i> | 95% <i>C. I.</i> |
| Demographic                 |                                    |           |          |              |              |                  |          |              |              |                  |
| Gender <sup>a</sup>         | -                                  | -         | .51*     | .25          | 1.67         | (1.03, 2.71)     | .67*     | .27          | 1.96         | (1.16, 3.29)     |
| Age                         | 46.53                              | 12.70     | 1.14***  | .15          | 3.14         | (2.35, 4.19)     | 1.16***  | .16          | 3.20         | (2.35, 4.34)     |
| Ethnicity <sup>b</sup>      | -                                  | -         | .29      | .42          | 1.34         | (.58, 3.06)      | .34      | .43          | 1.40         | (.60, 3.26)      |
| Education <sup>c</sup>      | -                                  | -         | .31      | .24          | 1.37         | (.85, 2.20)      | .38      | .25          | 1.46         | (.89, 2.40)      |
| Income (\$1000s)            | 80.91                              | 62.00     | -.13     | .15          | .88          | (.66, 1.17)      | -.13     | .15          | .88          | (.66, 1.18)      |
| Physical health             |                                    |           |          |              |              |                  |          |              |              |                  |
| Perceived                   | 3.52                               | .96       | -.62***  | .12          | .54          | (.42, .69)       | -.63***  | .13          | .53          | (.41, .69)       |
| Cardiovascular <sup>d</sup> | -                                  | -         | .64*     | .26          | 1.90         | (1.15, 3.13)     | .63*     | .26          | 1.89         | (1.13, 3.15)     |
| Cancer <sup>d</sup>         | -                                  | -         | -.01     | .33          | .99          | (.52, 1.91)      | -.02     | .34          | .98          | (.51, 1.91)      |
| Other chronic               | 1.93                               | 2.16      | .14      | .10          | 1.16         | (.95, 1.41)      | .12      | .11          | 1.13         | (.91, 1.40)      |
| Health behaviors            |                                    |           |          |              |              |                  |          |              |              |                  |
| Effort on health            | 7.13                               | 2.01      |          |              |              |                  | -.14     | .12          | .87          | (.68, 1.10)      |
| Sleep quality               | 4.70                               | 1.62      |          |              |              |                  | -.07     | .12          | .93          | (.74, 1.18)      |
| Alcohol <sup>d</sup>        | -                                  | -         |          |              |              |                  | -.45     | .47          | .64          | (.26, 1.60)      |
| Psych. Symptoms             |                                    |           |          |              |              |                  |          |              |              |                  |
| Depression                  | .65                                | 1.76      |          |              |              |                  | .04      | .14          | 1.04         | (.78, 1.38)      |
| Anxiety                     | .16                                | .95       |          |              |              |                  | -.09     | .13          | .92          | (.71, 1.19)      |
| Personality                 |                                    |           |          |              |              |                  |          |              |              |                  |
| Extraversion                | 3.18                               | .56       |          |              |              |                  | .09      | .16          | 1.09         | (.80, 1.50)      |
| Neuroticism                 | 2.23                               | .65       |          |              |              |                  | .08      | .14          | 1.08         | (.83, 1.42)      |
| Agreeableness               | 3.46                               | .49       |          |              |              |                  | .13      | .16          | 1.14         | (.83, 1.57)      |
| Conscientiousness           | 3.42                               | .44       |          |              |              |                  | .11      | .13          | 1.12         | (.87, 1.42)      |
| Openness                    | 3.02                               | .51       |          |              |              |                  | -.08     | .15          | .92          | (.69, 1.23)      |
| Partner variables           |                                    |           |          |              |              |                  |          |              |              |                  |
| RPES                        | 31.50                              | 77.52     | .00      | .12          | 1.00         | (.80, 1.25)      | .00      | .12          | 1.00         | (.80, 1.26)      |
| PPR                         | 3.53                               | .59       | .17      | .14          | 1.18         | (.90, 1.55)      | .13      | .14          | 1.14         | (.86, 1.51)      |
| RPES × PPR                  | -                                  | -         | -.27*    | .12          | .77          | (.60, .98)       | -.27*    | .12          | .77          | (.61, .97)       |
|                             | Nagelkerke's <i>R</i> <sup>2</sup> |           | .31      |              |              |                  | .31      |              |              |                  |

Note. \*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ ; <sup>a</sup> 0 = Female, 1 = Male; <sup>b</sup> 0 = White, 1 = Nonwhite; <sup>c</sup> 0 = High school or less, 1 = Some college degree or more; <sup>d</sup> 0 = No, 1 = Yes. For continuous variables, higher scores reflect higher standing on the variable. All continuous variables are standardized.

## Discussion

The present study is the first to document that PPR moderates the association between received emotional support and all-cause mortality risk, thus shedding light on the mixed findings obtained in previous studies. As predicted, the elevated mortality risk associated with high RPES was observed only among participants who perceived their partner as being low on responsiveness. In contrast, RPES was unrelated to mortality risk among those who perceived their partner as high in responsiveness. It is important to note that the analyses adjusted for a wide range of covariates (i.e., demographic factors, physical health status, health behaviors, psychological symptoms, and personality traits) that could have accounted for the findings. The present findings suggest that high PPR may be protective against the potential costs associated with received emotional support. The pattern of findings is also consistent with prior work showing that the existence of close relationships with available and responsive others provides a “social baseline” (Coan, 2010) for healthy human functioning, with deviations from it (e.g., unresponsive partners, low quality relationships, loneliness) increasing the risk for poor health outcomes (e.g., Robles & Kiecolt-Glaser, 2003).

Why does PPR moderate the association between RPES and mortality? Although more research on theoretical mechanisms is clearly needed, one hypothesis is that responsive partners provide support behavior that appropriately matches the needs of the recipient without decreasing the recipient’s sense of self-efficacy and independence. Although this hypothesis was not directly tested in the present study, other work suggests that the costs associated with received support are indeed reduced when the support provider avoids communicating a sense of inefficacy to the recipient (Bolger & Amarel, 2007). Future experimental studies building on this work are needed to confirm the extent to which PPR’s role in altering the effectiveness of



received support is mediated by the skillfulness of support behavior and self-efficacy appraisals of the support recipient.

In addition, future studies should test whether perceived responsiveness of other social network members (e.g., relatives, friends) moderates the association between received support from these individuals and health outcomes. Whether the current findings would generalize to other types of received support (e.g., instrumental) is also a question for future research.

Although PPR is different from *received* emotional support, is it different from *perceived* emotional support? Perceived emotional support has usually been defined as individuals' potential access to emotional support when they are distressed or in need. PPR, on the other hand, is a more general construct that entails not only the feeling of being cared for when needs arise but also the belief that relationship partners understand and appreciate what is important to one's self (e.g., Reis, 2007). Despite this theoretical distinction, no studies so far have investigated whether PPR is empirically distinct from perceived emotional support, which is an important question for future research.

Finally, a limitation of the current work was its reliance on the report of one partner to assess PPR and RPES. Future studies employing different methods (e.g., observing received support rather than asking to the participant) and measuring PPR and RPES from both partners would help reduce potential biases due to collecting self-report data from a single source. Moreover, such studies will also enable testing other interesting hypotheses regarding the interplay between PPR, received support, and health outcomes (e.g., whether received support is most effective when both partners report high responsiveness and least effective when both partners report low responsiveness). This limitation notwithstanding, the present study makes an important contribution to the recently growing literature on the health consequences of received

support (Uchino, 2009) by providing the first evidence that perceived partner responsiveness attenuates the association between received partner emotional support and all-cause mortality.

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## CHAPTER 4

### **Attachment and Exploration in Adulthood: The Associations of Perceived Partner Responsiveness with Quality of Daily Work, Goal Progress, and Life Satisfaction**

“All of us, from the cradle to the grave, are happiest when life is organized as a series of excursions, long or short, from the secure base provided by our attachment figure(s).”

Bowlby (1988, p. 62)

Work is a major feature of adults’ daily life (e.g., Killingsworth & Gilbert, 2010; White & Dolan, 2009), whether in the form of paid employment, volunteer involvement, or school activities. Adults devote approximately 30-50% of their daily awake time to this single activity (Howell & Rodzon, 2010; Kahneman et al., 2004). As a result, the perceived quality of daily work experience—that is, how involved individuals are in their daily work—is reliably associated with psychological well-being (e.g., Csikszentmihalyi & LeFevre, 1989). But what determines the quality of daily work?

Based on an attachment theory perspective (Bowlby, 1988), we hypothesize and provide evidence in two daily experience studies that perceived partner responsiveness—i.e., the extent to which individuals believe that their partner cares for, understands, and validates them (Reis et al., 2004)—predicts enhanced quality of work in daily life. According to attachment theory, healthy functioning in daily life depends on whether relationship partners are available and responsive when needed. The sense of security that comes with the perception that “attachment figures”—whether a parent in infancy or a romantic partner in adulthood—will be there for us when we need them enables us to devote our attention and resources to activities other than self-protection. In infancy and childhood, these activities involve playing and exploring the environment. Indeed, children with responsive parents are shown to be better at learning about

and mastering the physical and social environments (e.g., Ainsworth et al., 1978). In adulthood, work, as the major source of competence and environmental mastery, is the prototypical form of exploration (Hazan & Shaver, 1990). Despite the changes in the form of exploration that naturally occur with development, the importance of responsive relationship partners for daily functioning is thought to remain intact across the lifespan. Yet, to date, there has been no studies investigating whether perceived partner responsiveness is associated with increased quality of work in daily life. Therefore, the first aim of the present research was to address this question using the daily experience methodology, a highly reliable way of studying psychological phenomena in daily life (Bolger et al., 2003). In line with attachment theory's lifespan perspective, we examined the association between perceived partner responsiveness and quality of daily work in young adults (Study 1) as well as middle-aged and older adults (Study 2).

As the opening quote indicates, enhancement of exploration is seen by attachment theory as a central way by which responsive attachment figures contribute to well being. However, this prediction has not been examined in prior work. Thus, the second aim of the present studies was to examine whether quality of daily work mediates the association between perceived partner responsiveness and well-being. Based on prior findings showing that supportive romantic relationships facilitate progress toward achieving personal goals (Brunstein et al., 1996), Study 1 examined whether quality of daily work mediates the association between perceived partner responsiveness and daily goal progress. Study 2 extended these findings by investigating whether greater quality of daily work resulting from perceived partner responsiveness predicts increased life satisfaction measured an average of 20 months later.

Finally, the third aim of the present research was to investigate one of the potential mechanisms by which perceived partner responsiveness is associated with quality of daily work.



We hypothesized that perceived partner responsiveness buffers against the detrimental effects of daily social and environmental stressors on quality of work. In everyday life individuals encounter various stressful events. Negative affect induced by these events, and any tendency to ruminate about their causes or consequences are likely to interfere with quality of work. Prior experimental studies showed that activating mental representations of romantic partners following recall of such stressful events enhances recovery by reducing negative affect and negative thinking (Selcuk et al., 2012). Studies investigating whether stress buffering effects of romantic attachments generalize to daily life has been rare, with the few available focusing only on a specific type of stressor (e.g., work problems, Ditzen et al., 2008). No studies so far have investigated the stress buffering role of perceived partner responsiveness using measures covering the broad range of stressful events in daily life. Thus, Study 2 investigated whether perceived partner responsiveness buffers against the detrimental effects of common daily social and environmental stressors on quality of work. To the extent that perceived partner responsiveness enhances regulation of negative affect induced by stressors in daily life, it is expected that quality of work will suffer less on stressful days for individuals who perceive their partner as responsive compared to those who perceive their partner as unresponsive.

## Study 1

### Method

**Participants and procedure.** One hundred and six undergraduate students involved in a romantic relationship (81 women; mean age = 20 years,  $SD = 1$  year; relationship length range = 3-52 months) completed daily diaries for 14 days.

**Day-level measures.** *Perceived partner responsiveness* was assessed with three items (adapted from Maisel & Gable, 2009) asking participants to indicate the extent to which their

partner made them feel understood, cared for, and valued (1 = *Not at all* to 5 = *Very much*).

Table 4.1 in the supplemental material provides the means, standard deviations, and reliabilities of all measures used in Studies 1 and 2.

Prior work with undergraduate students shows that undergraduates' daily work mostly centers on academic activities (e.g., Howell & Rodzon, 2011). Accordingly, *quality of daily work* was assessed with the following two items (adapted from Kashdan & Steger, 2007): "Today, I tried to learn as much as I could" and "Today, I was so involved in my work that I lost track of time" (1 = *Strongly disagree* to 7 = *Strongly agree*).

Finally, to assess *goal progress*, participants responded to two items asking whether they had spent time working toward their goals and whether they had felt they made progress toward their goals that day (1 = *Strongly disagree* to 7 = *Strongly agree*).<sup>12</sup>

**Data analytic strategy.** Supplemental material provides the complete details of the multilevel data analysis strategy used in Studies 1 and 2.

## Results

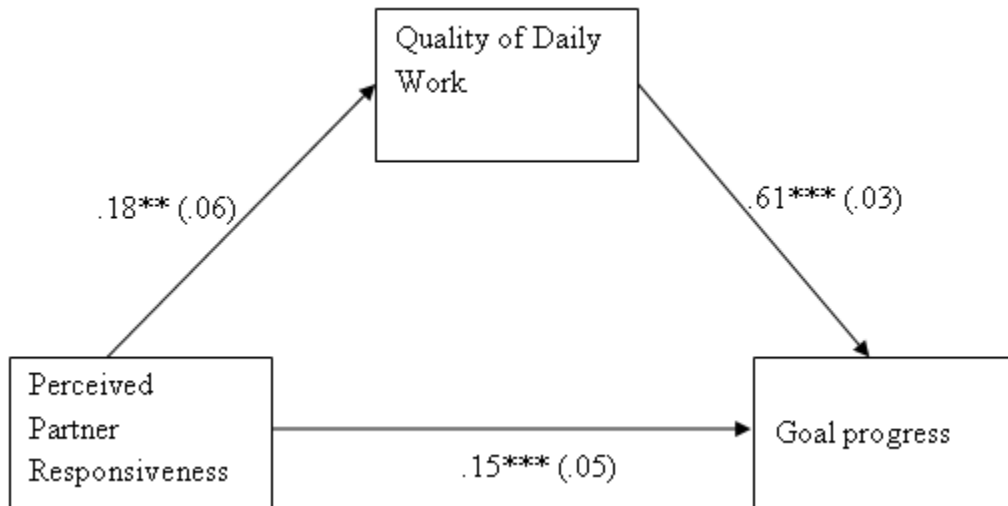
As predicted, perceived partner responsiveness was associated with increased quality of daily work, which, in turn, was associated with greater daily goal progress (indirect effect = .0915, 95% C. I. = [.0306, .1541]; Figure 4.1). We also examined the longitudinal association between perceived partner responsiveness and goal progress via quality of daily work, with a one-day lag. Replicating the concurrent findings, controlling for day  $t$  goal progress, there was an

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<sup>12</sup> Participants also completed two items assessing their *openness* to new experiences.

Perceived responsiveness was positively associated with daily openness ( $B = .26$ ,  $SE = .06$ ,  $p < .001$ ).

indirect association between day  $t$  perceived responsiveness and day  $t + 1$  goal progress via day  $t$  quality of work (indirect effect = .0162, 95% C. I. = [.0015, .0362]).



**Figure 4.1.** Quality of daily work as a mediator between perceived partner responsiveness and goal progress in Study 1. The numbers outside and inside of the parentheses are unstandardized coefficients and standard errors, respectively. \*\*\*  $p \leq .001$ , \*\*  $p < .01$ .

## Study 2

### Method

**Participants and procedure.** Participants were from the National Survey of Midlife Development in the United States II program project (MIDUS II; Ryff et al., 2007). The current sample consists of 1342 married or cohabiting adults (707 women; mean age = 56 years,  $SD = 12$  years) who completed a measure of perceived partner responsiveness in the MIDUS II self-administered questionnaire and subsequently participated in the National Study of Daily Experiences II (NSDE II; Ryff & Almeida, 2010). Following an average of 20 months (range = 2-56 months) after completing the NSDE II, a subsample of 288 individuals (152 women), who did not differ from the remainder of the current sample in terms of age, perceived partner responsiveness, or quality of work (all  $ps \geq .10$ ), completed a measure of life satisfaction as part

of the MIDUS Bioindicators project (Ryff et al., 2013), allowing us to test whether the longitudinal association between perceived partner responsiveness and life satisfaction was mediated by quality of daily work.

**Person-level measures.** In line with previous work using the MIDUS data (Selcuk & Ong, 2013), we created a *perceived partner responsiveness* score using three items asking participants to indicate how much their spouse or partner cares about them, understands the way they feel about things, and appreciates them. Participants responded to the items on a 4-point scale (1 = *A lot* to 4 = *Not at all*). Responses were reverse scored so that higher scores reflected greater perceived partner responsiveness.

*Life satisfaction* was measured with the Satisfaction with Life Scale (SWLS; Diener et al., 1985). SWLS is one of the most heavily used measures of life satisfaction in the literature. It consists of 5 items asking participants to make overall judgments about their life (e.g., “In most ways, my life is close to my ideals.”). Participants responded to the items using a 7-point scale (1=*Strongly Disagree*, 7 = *Strongly Agree*).

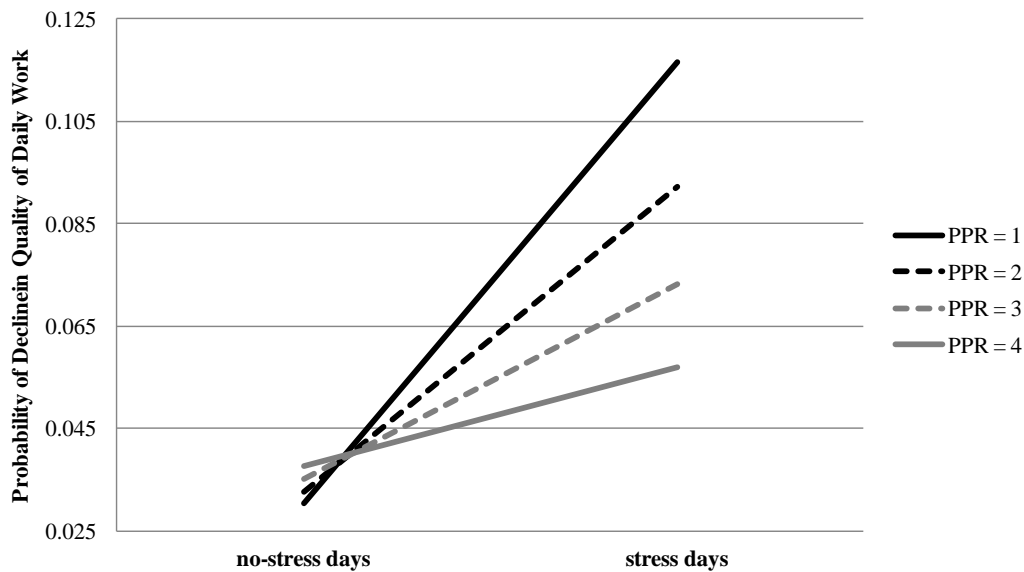
**Day-level measures.** *Stress exposure* was assessed using the Daily Inventory of Stressful Events (DISE), a measure of multiple social and environmental stressors including interpersonal conflict, problems at work, problems at home, perceived discrimination, something bad happening to a close other, and other stressors (Almeida et al., 2002). In the present sample, participants reported experiencing stressful events on 3,938 (40%) days. The number of stressors encountered on a single day ranged from 1 to 6 with the majority of participants (75%) reporting experiencing one stressor. Therefore, we operationalized stress exposure as a dichotomous variable (0 = No stressor, 1 = At least one stressor).

In addition, participants were asked to indicate whether the *quality of their daily work* (e.g., paid work, volunteer work) suffered that day (0 = *No*, 1 = *Yes*).

## Results

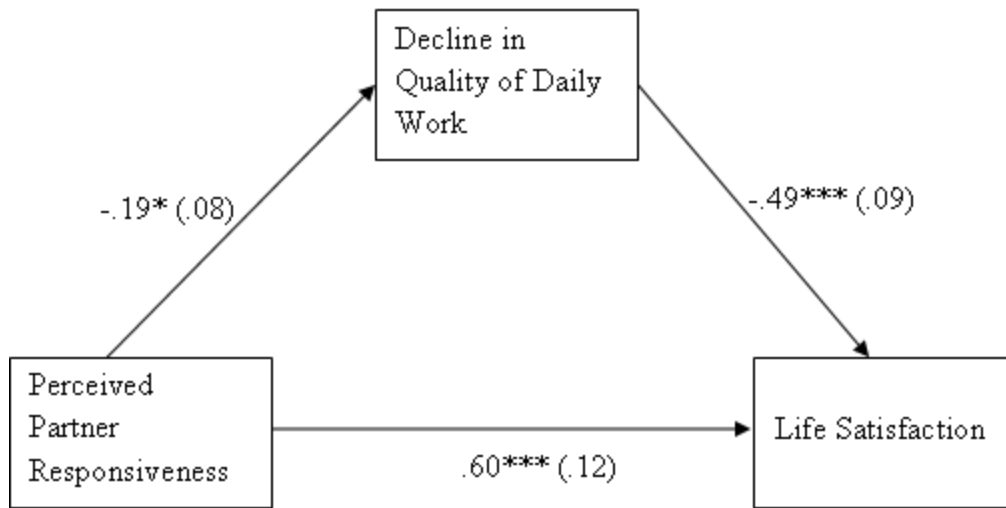
Multilevel modeling analyses revealed that individuals who perceived their partner as responsive were less likely to experience a decline in the quality of their daily work. ( $B = -.20$ ,  $SE = .08$ , odds ratio = .82,  $p = .018$ )

Daily stress exposure was associated with greater decline in quality of daily work ( $B = .58$ ,  $SE = .07$ , odds ratio = 1.78,  $p < .001$ ). However, supporting the buffering hypothesis, perceived responsiveness decreased the negative association between stress exposure and quality of work ( $B = -.33$ ,  $SE = .11$ , odds ratio = .72,  $p = .002$ ), indicating that quality of work suffered less on stressful days for participants who perceived their partners as responsive (Figure 4.2).



**Figure 4.2.** Probability of decline in quality of daily work as a function of daily stress exposure at different levels of perceived partner responsiveness (PPR).

Finally, we examined whether quality of daily work mediated the association between perceived partner responsiveness and life satisfaction. Given that life satisfaction was measured at the between-participants level, we computed person-level estimates of decline in quality of work. Perceived partner responsiveness was associated with less decline in quality of work, which in turn was associated with life satisfaction measured an average of 20 months later (indirect effect = .0931, 95% C. I. = [.0143, .1866]; Figure 4.3). The time lag between quality of work and life satisfaction measurements did not moderate the indirect association (all  $ps > .18$ ).



**Figure 4.3.** Quality of daily work as a mediator between perceived partner responsiveness and life satisfaction. The numbers outside and inside of the parentheses are unstandardized coefficients and standard errors, respectively.  $***p \leq .001$ ,  $*p < .05$ .

### General Discussion

The hypothesis that responsive attachment figures enhance exploration is central to attachment theory. Although prior laboratory work showed that greater partner responsiveness predicted increased self-reported willingness to explore challenges and novel experiences (e.g., “I am usually willing to accept challenges and try new things;” Feeney, 2004), and greater

persistence in and enthusiasm about a novel puzzle solving task (Feeney & Thrush, 2010), no studies so far have investigated whether perceived partner responsiveness is associated with quality of exploration in daily life. Work, whether it is paid employment, volunteer involvement, or school activities, is the major form of exploration in daily life for most individuals. The present studies provided the first evidence that perceived partner responsiveness predicts greater quality of daily work among young adults (Study 1) as well as middle-aged and older adults (Study 2).

In addition, Study 1 showed that enhanced quality of daily work mediated the association between perceived partner responsiveness and goal progress on the same and the next day. These findings are in line with previous work documenting benefits of maintaining supportive relationships for goal progress (Brunstein et al., 1996) and indicate that enhanced quality of daily work is one of the mechanisms underlying such benefits.

Study 2 further extended these findings by examining the attachment-theoretical hypothesis that perceived responsiveness contributes to subjective well-being in the long-term by enhancing quality of exploration. Specifically, our findings show that perceived partner responsiveness was associated with better quality of work, which in turn predicted life satisfaction measured an average of 20 months later.

Finally, Study 2 shed light on one of the mechanisms by which perceived partner responsiveness is associated with quality of daily work. In line with prior research on the stress buffering effects of romantic attachments (Selcuk et al., 2010, 2012), Study 2 showed that perceived partner responsiveness buffered the negative association between daily stress exposure and quality of work. Future research should investigate whether there are other possible mechanisms by which perceived partner responsiveness contributes to quality of work in daily

life. For instance, perceived partner responsiveness may enhance quality of daily work by reducing defensive reactions to failure (Caprariello & Reis, 2011) or enhancing challenge (vs. threat) appraisals (Elliot & Reis, 2003).

The rationale of the present study to focus on perceived responsiveness of romantic partners was based on prior work showing that romantic partners are the prototypical attachment figures in adulthood (e.g., Hazan & Shaver, 1987). However, individuals do form and maintain attachment bonds with other social partners such as parents, friends, relatives, and adult children (Selcuk et al., 2010). How perceived responsiveness of other social network members influence exploration is another question for future research.

Finally, our findings have implications for research on the relationship-work interaction. This research has traditionally focused on the negative influences of experiences in one domain (e.g., relationship) on the other domain (e.g., work) (see Eby et al., 2005 for a review). The present research indicates that the influence of relationships on work is not always negative. On the contrary, our findings clearly show that relationships with responsive partners are actually a stable source of support in daily life promoting quality of work. As such, the present findings also suggest that organizations' efforts to improve the quality of work experience of their members should take into account not only the characteristics of the work environment or the personality characteristics of the members (e.g., self-efficacy; Salanova et al., 2006) but also the quality of the members' close relationships.

Love and work have long been recognized as arguably the two most important domains of adult functioning. By examining how the two are related in daily life, the present studies contribute to the growing literature documenting the positive role of close relationships in adult functioning and psychological well-being.



## Supplemental Material

### Methods

**Table 4.1.** Means, Standard Deviations, and Reliabilities of the Measures in Studies 1 and 2.

|                                  | <i>M</i> | <i>SD</i> | Between-person<br>reliability | Within-person<br>reliability |
|----------------------------------|----------|-----------|-------------------------------|------------------------------|
| Study 1                          |          |           |                               |                              |
| Perceived partner responsiveness | 4.04     | .96       | .99                           | .90                          |
| Quality of daily work            | 4.07     | 1.58      | .93                           | .64                          |
| Goal progress                    | 4.65     | 1.57      | .97                           | .85                          |
| Study 2                          |          |           |                               |                              |
| Perceived partner responsiveness | 3.58     | .57       | .84                           | -                            |
| Life satisfaction                | 5.10     | 1.19      | .87                           | -                            |

*Note.* In Study 1, the between-participants reliabilities refer to the reliability of average of measures taken over 14 days and the within-participants reliabilities refer to reliability of change within participant throughout the study (Cranford et al., 2006).

### Data Analytic Strategy

**Study 1.** Participants completed 1346 (out of a total of 1,484; 91%) diaries. 1276 diary days (95% of the completed diaries) on which participants reported interacting with their partner were used in the present analyses.

Given the hierarchical structure of the data with daily measurements being nested within participants, multilevel modeling (HLM 7; Raudenbush et al., 2010) was used to test the study hypotheses. The Level 1 model estimated the within-person associations between perceived partner responsiveness, quality of work, and goal progress. The Level 2 model provided average estimates of the Level 1 coefficients for the entire sample. In all of the analyses in Studies 1 and 2, the Level 1 intercepts were treated as random. We also examined random effects for the slopes but found evidence in only four (out of a total of seven) cases in Studies 1 and 2. Given that the findings did not change depending on whether a random component for the slope was estimated in these cases, for simplicity and parsimony, Level 1 slopes were treated as fixed effects.

The model estimating the association between perceived partner responsiveness and quality of daily work on day  $t$  was as follows, where  $e$  represents the Level 1 error term and  $u$  represents random effect associated with the intercept:

Model 1:

$$\text{L1: } (\text{quality of work})_t = \beta_0 + \beta_1(\text{responsiveness})_t + e_t$$

$$\text{L2: } \beta_0 = \gamma_{00} + u_0$$

$$\beta_1 = \gamma_{10}$$

To estimate the indirect association between perceived responsiveness and goal progress via quality of work, a second model was estimated:

Model 2 (goal progress on the same day):

$$\text{L1: } (\text{goal progress})_t = \beta_0 + \beta_1(\text{responsiveness})_t + \beta_2(\text{quality of work})_t + e_t$$

$$\text{L2: } \beta_0 = \gamma_{00} + u_0$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

Model 2 (goal progress the next day):

$$\text{L1: } (\text{goal progress})_{t+1} = \beta_0 + \beta_1(\text{responsiveness})_t + \beta_2(\text{quality of work})_t \\ + \beta_3(\text{goal progress})_t + e_t$$

$$\text{L2: } \beta_0 = \gamma_{00} + u_0$$

$$\beta_1 = \gamma_{10}$$

$$\beta_2 = \gamma_{20}$$

$$\beta_3 = \gamma_{30}$$

The indirect association was computed as  $\gamma_{10}$  (Model 1)  $\times$   $\gamma_{20}$  (Model 2) and its 95% confidence interval was estimated using the Monte Carlo Method (MacKinnon et al., 2004; Selig & Preacher, 2008).

**Study 2.** In the current sample 9,919 (out of a total 10,736, 92%) diary days were completed. The data analytic strategy was the same as in Study 1 except that multilevel logistic modeling was used since the outcome variable was binary (whether quality of daily work suffered or not). The coefficients were estimated using population-average analysis (also referred to as Generalized Estimating Equations; Zeger et al., 1988). In all of the models, perceived partner responsiveness was centered around its mean.

The model estimating the association between perceived partner responsiveness and quality of daily work was as follows, where  $p$  referred to the probability of decline in quality of work:

$$\text{L1: } p_t = \beta_0$$

$$\text{L2: } \beta_0 = \gamma_{00} + \gamma_{01}(\text{responsiveness}) + u_0$$

To test the buffering role of perceived partner responsiveness, daily *stress* exposure was added to the model as follows:

$$\text{L1: } p_t = \beta_0 + \beta_1(\text{stress})_t$$

$$\text{L2: } \beta_0 = \gamma_{00} + \gamma_{01}(\text{responsiveness}) + u_0$$

$$\beta_1 = \gamma_{10} + \gamma_{11}(\text{responsiveness})$$

In this model, the coefficient  $\gamma_{11}$  represents the effect of perceived partner responsiveness on the slope of daily stress exposure. A negative regression coefficient reflects that perceived partner responsiveness lowers the negative association between stress exposure and quality of daily work, thus providing support for the buffering hypothesis.

Finally, the indirect association between perceived responsiveness and life satisfaction via quality of work was estimated using a subsample of 288 participants who completed a measure of life satisfaction as part of the MIDUS Bioindicators project after participating in the National Study of Daily Experiences II. (Another subsample of 383 individuals completed the two studies in the reverse order—i.e., first the Bioindicators project and then the National Study of Daily Experiences II—and hence were not included in the present analyses). Given that the outcome variable (i.e., life satisfaction) was measured at the between-participants level, the predictor variables could only estimate between-participants differences. Therefore, estimates corresponding to average decline in quality of daily work at the between-participants level were computed from the daily experience data (Raudenbush et al., 2010). The mediation analyses were performed using multiple regression models. As in Study 1, the 95% confidence interval for the indirect association was estimated using the Monte Carlo Method.

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## CHAPTER 5

### Conclusions

The present dissertation systematically investigated the role of adult attachments in affect regulation, exploration, and psychological and physical well-being. Chapter 2 showed that imagining a supportive interaction with or viewing a photograph of an attachment figure (mother or romantic partner), as compared to an acquaintance or a stranger, after recalling an upsetting event enhanced recovery by reducing negative affect and negative thinking. In addition, individuals who benefitted the most from viewing the photograph of their romantic partner were less likely to report physical and mental health problems even several weeks after the experiment.

Although these laboratory experiments provided strong support that responsive partners confer affect regulation and protective health benefits, receiving support from a romantic partner in daily life is sometimes found to be associated with worse outcomes. Chapter 3 showed that the effectiveness of received partner support depends on whether the partner is perceived as responsive or not. After controlling for demographic factors, initial physical health, health behaviors, psychological well-being, and personality traits, received partner support predicted increased mortality risk only for individuals who perceived their partner as low in responsiveness, but not for individuals who perceived their partner as high in responsiveness.

According to attachment theory, the sense of security provided by responsive partners not only enhances affect regulation but also facilitates exploration, which influences daily functioning outside the relationship, such as quality of work or the ability to meet personal goals. Chapter 4 investigated the link between attachment and quality of work—the most common and consequential form of exploration in adulthood—in two daily experience studies. The findings

showed that perceived partner responsiveness was associated with better quality of daily work in young, middle-aged, and older adulthood. Increased quality of daily work, in turn, predicted greater goal progress for young adults on the same as well as the next day, and greater life satisfaction for middle-aged and older adults after an average of 20 months.

Future research directions for each specific line of work have already been outlined in the respective chapters. Rather than repeating them here, this last section highlights broader future research avenues on adult attachment based on findings presented in the preceding chapters.

### **Implications of Attachment-Induced Affect Regulation for Psychological Well-Being**

Findings presented in Chapter 2 documented for the first time that simple reminders of attachment figures after recalling an upsetting experience facilitate affective recovery in a spontaneous, automatic, and effortless manner. These findings have important implications for psychological well-being. Human beings spend considerable amount of their time thinking about events that happened in the past, even when they seem to engage in an unrelated activity (Killingsworth & Gilbert, 2010). Often times our minds wander to unpleasant experiences such as an interpersonal conflict or a personal failure. Ruminating about whether the events might have gone differently, why we are still feeling sad and depressed, and how the future would be shaped by these events are a significant source of distress. Difficulty in coping with these negative memories and the resulting rumination are identified as major predictors of depression (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008) and cardiovascular disorder (Schwartz, Gerin, Davidson, Pickering, Brosschot, Thayer et al., 2003), two of the leading causes of disability-adjusted life-years, i.e., number of years lost due to ill-health, disability, or early death (World Health Organization, 2009). Thus, a key challenge for psychologists is to identify strategies that help regulate affect in response to recalling negative memories.

Findings presented in Chapter 2 suggest that using reminders of attachment figures is one such strategy, which is easy to implement in daily life (e.g., keeping a text message in your cell phone or a photograph on your desk) and helps regulate negative affect in a relatively effortless manner. Future research should investigate whether using this strategy would be effective for individuals who are at-risk for the adverse health consequences of negative memories. That is, would activating the mental representations of attachment figures enhance affect regulation following negative memory recall for individuals with high ruminative tendencies or depressive symptoms? If yes, would reminding oneself of attachment figures help reduce rumination and depressive symptoms in daily life? And, would using this strategy regularly lead to a long-term decline in ruminative tendencies and depressive symptoms? Future research addressing these questions will be very useful to further our understanding of the potential ways by which individuals can effectively cope with negative events and maintain their well-being.

### **Neurobiological Mechanisms Underlying Regulatory Effects of Attachments**

How do attachment relationships enhance affect regulation in response to stressors? The exact mechanisms underlying regulatory effects of attachments are yet to be fully understood. However, extant studies in the primate model of attachment and recent work in humans suggest that one possible mechanism is the endogenous opioid system (Machin & Dunbar, 2011). Positive interactions with attachment figures enhance opioid neurotransmission (Depue & Morrone-Strupinsky, 2005), and enhanced opioid neurotransmission is closely linked to stress regulation in both laboratory settings and in daily life (e.g., Chong, Oswald, Yang, Uhart, Lin, & Wand, 2006; McCubbin, Bruehl, Wilson, Sherman, Norton, & Colclough, 1998). Emerging studies with humans provide support for the role of opioids in attachment-induced affect regulation. For instance, Eisenberger and colleagues (e.g., Eisenberger, Master, Inagaki, Taylor,

Shirinyan, Lieberman, & Naliboff, 2011) showed that viewing the photograph of one's romantic partner (vs. a stranger or an object) while receiving painful stimulation led to down-regulation of pain responses, a process related to mu-opioid activity. Recently, Selcuk and colleagues (Selcuk, Fu, Günaydin, Moore, Schweitzer, & Depue, 2013) provided more direct evidence for the role of opioids in a study on the effects of soft tactile stimulation, a characteristic feature of close social bonds. Their findings revealed that the effect of soft touch on heat tolerance was moderated by naturally occurring variation in the mu-opioid receptor gene (as measured by the functional A118G polymorphism), with G allele carriers, who are more sensitive to social cues as compared to A allele homozygotes (e.g., Way, Taylor, & Eisenberger, 2009), showing increased heat tolerance as a result of soft tactile stimulation. Taken together, these findings are among the first in humans pointing to the role of the opioid system in attachment-induced regulatory effects.

The release of opioids is also known to promote the formation and consolidation of positive memories with attachment figures (Depue & Morrone-Strupinsky, 2005), activation of which enhances affect regulation as indicated by findings in Chapter 2. Given these findings, future research should investigate whether the effect of activating mental representations of attachment figures on affect regulation is moderated by endogenous opioid functioning. Studies manipulating opioid functioning by administering an opioid antagonist (vs. a placebo; see Depue & Morrone-Strupinsky, 2005, for an example) would be well-suited to investigate this question.

Given that enhanced opioid neurotransmission attenuates stress (Chong et al., 2006; McCubbin et al., 1998), an interesting possibility is that increased exposure to opioids as a result of repeated interactions with responsive partners leads to long-lasting down-regulation of stress response systems (hypothalamic-pituitary-adrenal axis, autonomic nervous system; see also Diamond, 2001). If this is the case, then maintaining attachments with responsive partners should

predict lower negative affect and better psychological well-being in the long-term. This prediction was recently supported in a longitudinal study (Selcuk & Ong, 2013) which showed that perceived partner responsiveness predicted greater positive affect, life satisfaction, autonomy, environmental mastery, and personal growth, and lower negative affect and depressive symptoms 10 years later, even after controlling for initial levels of psychological well-being. Whether these associations are mediated by down-regulation of stress reactivity in daily life is an important question for future research.

### **Intergenerational Transmission of Adult Attachment Style**

The meta-analysis of three experiments in Chapter 2 revealed that individuals with an avoidant attachment style showed less affective recovery as a result of priming the mental representation of an attachment figure. Indeed, self-reported adult attachment style has been consistently linked to affect regulation in prior research. Using various markers of negative affect and stress (e.g., self-reported negative affect, electrodermal, HPA, or ANS activity, neural threat responding), studies have shown that insecure attachment is associated with decreased ability to regulate negative affect in response to various stressors such as threats to a romantic relationship, having a chronically ill significant other, war, chronic pain, and threatening laboratory stimuli (see Mikulincer and Shaver, 2008, for a review). Based on these findings, Pietromonaco, Barrett, and Powers (2006) argued that self-reported adult attachment style mainly reflects individual differences in stress reactivity and the ability to regulate negative affect.

Given studies in animal models showing that individual differences in stress regulation are intergenerationally transmitted through early caregiving (e.g., Meaney, 2010), Pietromonaco and colleagues' hypothesis raises the question of whether there is intergenerational transmission of self-reported adult attachment style. Although direct longitudinal evidence is missing (yet),

two recent studies provide initial support for the possibility of intergenerational transmission of self-reported adult attachment style. In one study, Selcuk, Günaydin, Sumer, Harma, Salman, Hazan et al. (2010) conducted extensive observations of mothers' interactions with their one- to four-year-old child at home settings. They found that mothers who were anxiously or avoidantly attached to their spouse were less sensitive caregivers to their child. In another study which followed individuals for more than two decades, Zayas, Mischel, Shoda, and Aber (2011) reported that lower maternal sensitivity when children were 18 months old predicted greater attachment anxiety and avoidance in romantic relationships when children were in their early twenties. Taken together these two studies provide some initial support for intergenerational transmission of self-reported adult attachment style. An important goal for future longitudinal research is to directly investigate this issue and identify which factors in addition to early caregiving (e.g., socioeconomic status, parental conflict) explain continuity in adult attachment style across generations.

### **Formation of Adult Attachments**

Despite the great deal of information revealed by research on adult attachment in the last 25 years, we still know little about how romantic attachments are formed (Hazan & Selcuk, 2013). How do two individuals progress over time from being relative strangers to being capable of regulating each other's affect and physiology? What are the affective, cognitive, and behavioral "markers" of adult attachment? These questions will undoubtedly be at the top of the future research agenda on adult attachment.

### **Concluding Remarks**

The ability to form and maintain close relationships is closely linked to mental, physical, and social functioning across the lifespan. Using multiple methods including experiments,

longitudinal follow-ups, and daily experience designs, the present studies systematically investigated how adult attachment relationships influence diverse aspects of our lives from affect regulation to quality of daily work, with long-term consequences for physical health and psychological well-being. Chapter 2 showed the first evidence on the effects of attachment figure representations on enhancing affective recovery following recall of negative memories as well as the consequences of these effects in the short-term (i.e., reducing negative thinking) and the long-term (i.e., protecting against health problems). Chapter 3 shed light on the mixed findings on the association between received partner support and well-being by showing for the first time that perceived partner responsiveness moderates the association between received partner support and all-cause mortality. Finally, Chapter 4 documented the first evidence on the positive association between perceived partner responsiveness and quality of daily work—the most consequential form of exploration in adulthood—and the consequences of this association for psychological well-being (i.e., greater goal progress and life satisfaction). Collectively, these findings make important contributions to our growing understanding of the pervasive influence of close relationships on how happy and healthy we live.

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