THE ROLE OF ATTACHMENT IN THE USE OF
POSITIVE EMOTION REGULATION AFTER STRESS

BY

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ABSTRACT

When faced with stress, individuals lower on the anxious and avoidant attachment dimensions are typically successful emotion regulators, while individuals higher on the anxious or avoidance dimensions are normally poor at emotion regulation. The current study aims to test differences in the ability to use positive emotion regulation between individuals who are high/low on the anxious and avoidant attachment dimensions. Participants saw both funny and unfunny cartoons and rated them based on preference and enjoyment. Then participants were randomly assigned to see more of either the funny or unfunny cartoons at the end of the experiment and then performed mental arithmetic. Finally, participants rested during the recovery period and then saw their assigned cartoons. Throughout the experiment, participants rated their pleasantness and unpleasantness while their physiological reactions were measured. Surprisingly, there was non-hypothesized significant three-way interaction between condition, anxious attachment, and avoidant attachment such that in the neutral condition, individuals higher or lower on either dimension exhibited low unpleasantness while individuals higher on one dimension and lower on the other dimension exhibited high unpleasantness. Implications of the findings are discussed in light of current attachment and emotion regulation theory.
INTRODUCTION

Disorders in emotion regulation have been shown to cause many problems in mental (e.g., Hu et al., 2014) and physical (e.g., Singh & Mishra, 2011) health. Investigators have been very interested in looking at these disorders in order to find possible predictors, mechanisms, and treatments for these problems. Attachment is a strong predictor of emotion regulation problems, such that differences in attachment are predictive of the individual’s typical emotion regulation strategies (Mikulincer & Shaver, 2007). One particular aspect of attachment and emotion regulation that will be examined in this study is how individuals who are higher and/or lower on the attachment dimensions are able (or not able) to successfully use the emotion regulation strategy of anticipating a positive event to recover from a stressor.

Attachment has traditionally been conceptualized in the developmental literature as orthogonal groups: secure attachment, insecure-anxious attachment, and insecure-avoidant attachment (Ainsworth & Bowlby, 1954). In a secure attachment, the attachment figure, usually the parent, is seen as a secure base and this leads to secure internal working models for how all social interactions should be conducted, so in this conceptualization attachment group that is learned and developed in childhood should translate to the same type of internal working model of attachment in adults (Bowlby, 1982). This type of attachment predicts better developmental outcomes in several ways, including emotional capacity, emotional understanding, and future peer and other types of relationships (Carlson & Sroufe, 1995; Contreras & Kerns, 2000; Sroufe, Egeland, & Kreutzer, 1990).
There are several types of attachment styles that are labeled as insecure attachment types in the developmental literature: avoidant, anxious, and disorganized (Ainsworth, Blehar, Waters, & Wall, 1978). Avoidant attachment is typically characterized by children not wanting anything to do with the attachment figure; essentially, the child ignores the parent. Anxiously attached children are usually seen as children who want the parent’s attention, but resist it at the same time. So, in the case of separation, the child will cry when the parent returns, but also will try to pull away when the child is being held after the reunion. A child who has a disorganized attachment is typically from an impoverished situation, be that emotionally, physically, and/or socioeconomically. This type of attachment is characterized by many different reactions from the child; principally, the child does not know how to respond to an attachment figure because one was most likely not present during most of their development.

Conversely, social psychologists have developed a different conceptualization of attachment, two continuous dimensions of anxious and avoidant, and these dimensions are focused mainly on adult attachment rather than childhood attachment. This conceptualization of attachment works because the continuity between childhood and adulthood internal working models of attachment is seen as relatively stable (Fraley, 2002), but may have some fluidity between relationships as the individual develops, especially when a major life event occurs. For example, in three longitudinal studies, researchers found that attachment from infancy to adolescence to early adulthood was stable and the change occurred if there was a major change in family environment (e.g., divorce; Waters, Hamilton, & Weinfield, 2000).
In the anxious and avoidant attachment dimensions, individuals are not seen as discretely secure, avoidant, or anxious, but as having a general attachment style that is higher or lower on a continuum of avoidant and anxious (Fraley & Shaver, 2000; Figure 1). Individuals higher on the anxious and/or avoidant dimension are traditionally thought of as ‘insecurely attached’, whereas individuals lower on both dimensions are traditionally thought of as ‘securely attached’ (Jones, Brett, Ehrlich, Lejuiz, & Cassidy, 2014). The anxious attachment dimension is defined as “the degree to which individuals worry about being underappreciated and possible abandoned by their romantic partners” (Simpson & Rholes, 2012, p. 284), while the avoidant attachment dimension is defined as “the degree to which individuals feel comfortable with closeness and emotional intimacy in relationships” (p. 284). I chose to measure attachment as continuous dimensions, as opposed to categories, because these two attachment dimensions have been shown to be factors of other attachment self-report measures (Berry, Band, Corcoran, Borrowclough, & Wearden, 2007; Brennan, Clark, & Shaver, 1998). There are different developmental, social, and emotional outcomes that are possible for individuals who are higher or lower on the attachment dimensions. Here, I will discuss the relationship between attachment and emotional outcomes, specifically, differences in emotion regulation abilities.
ATTACHMENT AND EMOTION REGULATION

A fairly recent theoretical model of the attachment system integrates emotion regulation into the two dimensions of attachment (Mikulincer, Shaver, & Pereg, 2003; Shaver & Mikulincer, 2002). In this model, the attachment system is activated by a threat, which leads to the individual seeking the attachment figure. Depending on the individual, the attachment figure is either available or not available and this predicts particular strategies for emotion regulation. The strategy that is activated in these situations is security-based (low anxious and avoidant; successful emotion regulation), anxiety-based (high anxious; up-regulation of emotion), or avoidance-based (high avoidant; down-regulation of emotion or avoidance of emotion). Therefore, the general patterns and strategies of emotion regulation for individuals who are high/low on the anxious and/or high/low on the avoidant attachment dimension will be discussed separately to most clearly explain the similarities and differences between the dimensions in relation to emotion regulation.
Low Anxious and Low Avoidant Attachment

Developmentally, individuals who are lower on anxious and avoidant attachment dimensions have an advantage as compared to individuals higher on either or both attachment dimensions (Carlson & Sroufe, 1995). Being lower on both attachment dimensions may allow individuals to learn about and experience more emotions, which in turn enables them to name emotions, learn how to deal with emotions, and correctly respond to emotions when they are experienced (Carlson & Sroufe, 1995; Contreras & Kerns, 2000; Schore, 2001). Teachers also notice the difference in emotional understanding between children who are lower and children who are higher on the anxiety and avoidant attachment dimensions; teachers rate children who are lower on the anxiety and avoidance attachment dimensions as having better emotional health than children who are higher on these dimensions (Sroufe, Egeland, & Kreutzer, 1990).

Further, this ability to understand their emotions and to regulate those emotions seems to carry over into the adolescent years and adulthood. In fact, a longitudinal study showed that attachment in adolescents is predictive of their emotion regulation strategies as adults; participants who report lower levels of anxiety and avoidant attachment as adolescents are less likely to use emotion-focused regulation strategies (and this strategy is more highly correlated with higher anxious attachment, so using not as helpful emotion regulation strategies) as adults and are more likely to use support-seeking strategies (Dubois-Comtois, Pascuzzo, Cyr, & Moss, 2013). These developmental studies demonstrate that individuals who are lower on both attachment dimensions may be better at emotion regulation in general as compared to individuals higher on either or both attachment dimensions.
In addition to the developmental psychologists, the social psychologists have further demonstrated these individuals’ successful emotion regulation abilities, as individuals who are lower on the anxious and avoidant attachment dimensions are more likely to use coping and emotion regulation strategies that lower self-reported negative affect as well as a increase the speed of physiological recovery after stress (Abraham & Kerns, 2013; Diamond & Hicks, 2005; Howard & Medway, 2004; Mikulincer, Shaver, & Pereg, 2003; Shaver & Mikulincer, 2007). In their chapter, Shaver and Mikulincer (2007) explain these individuals’ successful emotion regulation as the ability to use strategies such as reappraisal or problem solving. For example, in a study of individuals who had recently been through a break-up, researchers found that those with lower scores on the anxiety and avoidance attachment dimensions (as opposed to those higher on either or both dimensions) were more likely to use the successful coping strategies, such as their social connections, than to use more destructive coping strategies, such as drinking a large amount of alcohol (Davis, Shaver, & Vernon, 2003).

Aside from the self-report studies demonstrating the abilities of individuals who are lower on anxious and avoidant attachment dimensions to regulate their emotions better than individuals higher on either or both attachment dimensions, research also shows that these individuals physiologically recover from stressors more successfully than individuals higher on either or both attachment dimensions (e.g., Diamond & Hicks, 2005). The heart rate of individuals low on both dimensions typically increases during stress and then decreases back to baseline during recovery, while heart rate variability (RSA) is normally in the opposite pattern (Diamond & Hicks, 2005; Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006). RSA is a measure of vagal tone and defined as
the variability of an individuals’ heart rate (Yasuma & Hayano, 2004) and has a rich history in the literature as an indicator of emotion regulation. For example, individuals who have a low RSA after stress do not typically use emotion regulation techniques that increase RSA after stress, and consequently are labeled as poor emotion regulators (Porges, Doussard-Roosevelt, & Maita, 1994), and are also more emotionally reactive (Fabes & Eisenberg, 1997; Fabes, Eisenberg, & Eisenbud, 1993). Further, RSA differences have been linked to individual differences in attachment (Mikulincer, Shaver, & Pereg, 2003). A study by Diamond and Hicks (2005) demonstrated that even in specific situations, such as the context of secure romantic relationships, participants who were lower on both attachment dimensions were more likely to have a high RSA during recovery from a stressor in relation to their RSA during the stressor. This indicates that these participants physiologically recovered from stress and also shows that emotion regulation strategies that decrease negative emotions can carry over to physiological recovery.

The reviewed literature demonstrates that these individuals typically regulate negative emotions after stress most likely due to their ability to use coping strategies, such as social support and problem solving. The use of coping strategies that aid in regulating negative emotions may lead to experiencing more positive emotions (Torquati & Raffaelli, 2004) and having more positive interactions with others (Abraham & Kerns, 2013). Further, the ability to regulate negative emotions may lead to a higher emotional understanding and may predict regulating negative emotions as adults (e.g., Howard & Medway, 2004). All these emotion regulation benefits demonstrate that not only is
successful emotion regulation important, but individuals lower on both attachment dimensions gain social, emotional, and developmental benefits from it.

**High Anxious Attachment**

The research examining individuals who are higher on the anxious attachment dimension has overwhelmingly demonstrated that these individuals have maladaptive emotion regulation strategies as compared with individuals who are lower on both dimensions (Davis, Shaver, & Vernon, 2003; Kim, Sharp, & Carbone, 2014; Mikulincer & Shaver, 2007). When faced with stress, the go-to emotion regulation strategy for individuals who are higher on the anxious attachment dimension is rumination and the up-regulation of negative emotions (van der Houwen et al., 2010). Research has shown that individuals who are higher on the anxious attachment dimension experience a higher intensity of emotions than do individuals who are higher on the avoidant attachment dimension or individuals lower on both dimensions (Searle & Meara, 1999; van der Houwen et al., 2010). Further, individuals higher in anxious attachment also report experiencing more negative emotions as well as reporting these more negative emotions at a higher intensity (Torquati & Raffaelli, 2004). This finding may be related to the individual’s development. Those who are higher on the anxious attachment dimension are motivated to prolong and intensify negative emotions because they have learned while growing up that demonstrating negative emotions increases the probability that they will receive the attention from their caregiver that has been inconsistent in the past (Hünefeldt, Laghi, Ortu, & Balardinelli, 2013; Mikulincer & Shaver, 2007). Thus, they are not likely to attempt self-soothing emotion regulation techniques because this would demonstrate that they actually do not need help and therefore do not need the attention of
the caregiver (Mikulincer & Shaver, 2007). Additionally, a study examining break-ups in adult romantic relationships found that individuals who are higher on the attachment anxiety dimension used less effective coping strategies to deal with the break-up, such as using illicit drugs and alcohol (Davis, Shaver, & Vernon, 2003). These coping and emotion regulation strategies are usually successful at gaining the attention of the caregiver or significant other, so for the purposes of individuals higher on the anxious attachment dimension, these strategies seem to be beneficial. On the other hand, these strategies may not always be adaptive. For example, if the caregiver/significant other is not responsive to the individual or if the caregiver/significant other is not present, negative emotions will likely be up-regulated without the benefit of gaining the caregiver’s attention (Hünefeldt, Laghi, Ortu, & Balardinelli, 2013). Thus, these individuals may have longer lasting, and possibly more intense, negative emotional experience without the relief a caregiver or significant other can provide.

Physiological data mirrors self-report data that demonstrates that individuals who are higher on the anxious attachment dimension do not recover well from stress. Several studies have shown that individuals who are higher on the anxious attachment dimension release more cortisol than individuals lower on both attachment dimensions or higher on the avoidant attachment dimension when exposed to stress (Borelli et al., 2010; Quirin, Pruessner, & Kuhl, 2008; for review, see Pietromonaco, DeBuse, & Powers, 2013). For example, when participants who are higher on anxious attachment experience relationship conflict with their significant other, they do not easily recover from this stress either emotionally or physiologically, as their bodies continue to produce cortisol and their emotions remain negative (Powers, Pietromonaco, Gunlicks, & Sayer, 2006).
Further, studies have also demonstrated that these individuals’ heart rate increases during stress and remains elevated after stress (Roisman, 2007; Zelenko et al., 2005); on the other hand, their RSA decreases during stress and does not increase after stress (Obradovic, Bush, Stamperdahl, Adler, & Boyce, 2010), which is the opposite pattern of those who are lower on both attachment dimensions. These physiological reactions of individuals who are higher on the anxious attachment dimension show that these individuals are not regulating their physiology after stress, which is convergent with behavioral and self-report data.

The above literature demonstrates that individuals who are higher on the anxious attachment dimension do not regulate negative emotions after stress, most likely due to their use of strategies such as the up-regulation of negative emotions (Mikulincer & Shaver, 2007). Although in some situations these coping and emotion regulation strategies may be adaptive, overall, these strategies may lead to experiencing a higher quantity of and more intense negative emotions as well as a continued physiological reaction after the stressor has ended (Torquati & Raffaelli, 2004).

**High Avoidant Attachment**

Individuals who are higher on the avoidant attachment dimension have more complex patterns of responses to stress as compared to individuals higher on the anxious attachment dimension or lower on both dimensions, in that their physiological responses do not seem to follow their self-report responses. These individuals report that during stress, their negative emotions increase and after stress (during recovery) their negative emotions decrease (Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006; Quirin, Pruessner, & Kuhl, 2008), which is the same pattern that is reported by individuals who
are lower on both attachment dimensions. However, these self-report data are in conflict with the literature that examines individuals who are higher on the avoidant attachment dimension’s physiological responses to stress (Quirin, Pruessner, & Kuhl, 2008; Yee & Shiota, 2015). That is, when these individuals are exposed to stress, their body physiologically reacts to the stress, but they do not physiologically recover from the stress as they report in their emotion ratings (Davis, Shaver, & Vernon, 2003), so their physiological pattern looks more like those with high anxious attachment. Taken together, this evidence suggests that these individuals are poor emotion regulators (Djoric & Medjedovi, 2011; Shaver & Mikulincer, 2007). This contention in the literature demonstrates that there may be a disconnect between the self-reported emotions and the physiological reactions in individuals who are higher on the avoidant attachment dimension.

Current research agrees that individuals who are higher on the avoidant attachment dimension are not good at regulating their emotions (Davis, Shaver, & Vernon, 2003), but the reason they are poor regulators is controversial. There are two lines of research that address the possible reasons. One hypothesis is that because emotional stimuli may be threatening, these individuals tend to avoid most emotional stimuli (Mikulincer & Shaver, 2007). For example, research shows that for individuals who are higher on the avoidant attachment dimension, attentional cues are not related to a specific positive or negative emotional bias, which means they avoid information that may be threatening, even if the stimulus is positive (Dewitte, De Houwer, Koster, & Buysse, 2007). These individuals’ bias away from emotional stimuli is due to the fact that they do not know to predict whether the stimulus is positive or negative and therefore,
they attempt to avoid emotional stimuli that are potentially ambiguous and threatening. This may help explain why these individuals are typically biased away from emotions and emotional stimuli as well as suggest the possibility that individuals higher on the avoidant attachment dimension do not attend well to emotional information.

A contradictory line of research posits that individuals who are higher on the avoidant attachment dimension do not avoid stimuli; instead, they attend to, process, and have more intense emotional experiences than individuals higher on the anxious attachment dimension or lower on both dimensions. These individuals have difficulty communicating those emotions to others (Garrison, Kahn, Sauer, & Florczak, 2012; Searle & Meara, 1999). This line of research focuses more on the physiological reactions of these individuals. For example, physiological reactions (such as HR, RSA, and skin conductance) of individuals who are higher on the avoidant attachment dimension show that these individuals have reactions to stress, much like those who are lower on both attachment dimensions as well as individuals who are higher on the anxious attachment dimension, but those higher on avoidant attachment do not recover from the stress the same way that individuals lower on both dimensions do (Feeney & Kirkpatrick, 1996; Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006; Quirin, Pruessner, & Kuhl, 2008). Investigators in this line of research suggest that the self-reported emotions from individuals higher on the avoidant attachment dimension show the inability to properly communicate their emotions. Instead, these individuals seem to report that everything is fine while their physiological reactions tell a different story.

In examining these two opposing theories in the avoidant attachment literature, it seems that there may very well be a disconnect between these individuals’ physiological
reactions and their self-reported emotions after stress. It is clear that individuals higher in avoidant attachment are poor emotion regulators after stress, most likely due to their avoidance of potentially threatening emotional stimuli or their inability to report their emotions correctly. Given this research, it is important to include both self-reported emotions as well as physiological reactions in the present study.

As the reviewed literature demonstrates, individuals high and/or low on the anxious and avoidant attachment dimensions have different patterns of emotion regulation. Individuals low on both dimensions use coping and emotion regulation strategies that decrease their negative emotions and physiological reactions after stress, whereas individuals high on the anxious attachment dimension do not use strategies that decrease their negative emotions or physiological reactions after stress; instead, they up-regulate these negative emotions which in turn does not allow their physiological reactions to return to homeostasis. On the other hand, individuals higher on the avoidant attachment dimension report decreasing their negative emotions after stress, however, their physiological reactions do not return to homeostasis and they may actively attempt to avoid potentially ambiguous emotional stimuli. These emotion regulation patterns have almost exclusively involved the individual’s ability to decrease negative emotions after stress. Recently, there is a fast growing interest in learning how people use positive emotions to regulate stress. I will be the first one to examine this question as a function of attachment. The question in the present study is whether individuals who differ on the attachment dimensions can successfully use positive emotion regulation given the previously reviewed problems with emotion regulation. Further, it is important to first explore how individuals who are higher/lower on the attachment dimensions typically
experience, process, and respond to positive emotions in their environments. The next section will discuss the research on positive emotions as well as how attachment and emotion regulation are related to positive emotions and positive emotion regulation.

**POSITIVE EMOTIONS**

In the past few decades, positive emotions have become a topic of focus in the area of stress research, as they may have many benefits to individuals in general. The Broaden-and-Build Theory of Positive Emotions (Fredrickson, 1998) outlines a way in which positive emotions evoked before a stressor help to mitigate the negative emotions and outcomes the stressor may cause. This theory posits that prior to a stressor, attending to positive emotions serves to broaden one’s thought-action repertoires, which are all the possible thoughts one could have and the actions one could take in the situation (Fredrickson & Branigan, 2005). When individuals experience positive emotions, their thought-action repertoires are broadened and their cognitions are expanded as well, which means they will be more likely to use an emotion regulation technique that will be helpful in decreasing negative emotions. Thus, these individuals can increase their ability to use the many types of support that may be advantageous during stress, such as physical, social, intellectual, and psychological resources (Fredrickson, 1998; 2001). These resources are gathered from positive emotions, last through a stressor, and even help the individual cope and regulate emotions after the stressor (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Waugh, 2014). This theory becomes particularly interesting during the recovery phase because researchers hypothesize that during recovery, the experience of positive emotions may undo the negative effects of stress (Fredrickson & Levenson, 1998).
The undoing hypothesis states that in circumstances when positive emotions immediately follow the negative emotions (of the stressful event), positive emotions may undo the negative physiological and psychological reactions (e.g., the cardiovascular response of a stressor or negative emotions) to an event (Fredrickson & Levenson, 1998). Individuals can broaden their range of responses to the stressor by using positive emotions to lower the likelihood of the immediate response tendency, take away the narrowing effect of negative emotions, or stop these responses altogether. By doing this, the individual is able to switch attention from negative to positive emotions and therefore gain the benefits of positive emotions. For example, in a pioneering study, Fredrickson and Levenson (1998) examined participants’ recovery (measured by cardiovascular changes and self-reported positive and negative emotions) and found that participants who had more positive emotions demonstrated faster cardiovascular recovery. Clearly, positive emotions are useful for regulating stress.

**POSITIVE EMOTIONS AND ATTACHMENT**

As reviewed, positive emotions are beneficial to use in regulating negative emotions after stress. However, as previously mentioned, nothing in the current literature suggests how attachment fits into theory of using positive emotion regulation after stress. In this section, I theorize about how likely individuals higher and/or lower on the attachment dimensions are to use positive emotion regulation after a stressor.

Besides being good at general emotion regulation (e.g., Shaver & Mikulincer, 2007), individuals who are lower on both attachment dimensions are also more likely to feel positive emotions when alone and with close others (Contreras & Kerns, 2000; Torquati & Raffaelli, 2004). For example, researchers took several measures six or seven
times each day for one week, including participants’ self-reported emotions, current activity, and who they were with (Torquati & Raffaelli, 2004). Results demonstrate that throughout the day and in all kinds of social situations, participants who are less anxiously and avoidantly attached endorse feeling more positive emotions as well as reporting feeling the extremes of those positive emotions (e.g., extremely happy), whether alone or with others. Since these individuals are more likely to experience positive emotions more frequently and in more situations than individuals who are higher on the anxious or avoidant attachment dimensions, this suggests that individuals lower on the anxious and avoidant attachment dimensions may experience other benefits of positive emotions, such as more positive relationships. In fact, individuals lower on both attachment dimensions do have more positive social relationships and more positive interactions with peers than individuals higher on the anxious or avoidant attachment dimensions (Abraham & Kerns, 2013; Torquati & Raffaelli, 2004). In a study that examined peer relationships, attachment, coping strategies, and emotions, researchers found that girls who were less anxious and avoidant in their attachments experienced more positive emotions, less negative emotions, and were rated as having more positive relationships with their peers (Abraham & Kerns, 2013).

Further, these individuals are flexible in their emotion regulation strategies for different stressors and they are able to implement these different strategies depending on what the situation warrants (Shaver & Mikulincer, 2007). As previously reviewed, using positive emotions is a good regulatory tool and additionally, it has been shown that there are reliable individual differences in those who can use positive emotions during recovery, such as trait resilience (Fortinsky, Tennen, & Steffens, 2013; Ong, Bergeman, Bisconti,
& Wallace, 2006; Tugade & Fredrickson, 2004). Ong and colleagues (2006) found that there was a difference between widows who were high versus low in trait resilience, where high resilient widows, as opposed to low resilient widows, experienced positive emotions and this experience helped them to effectively recover from next day stressors. This demonstrates that positive emotion regulation is a good strategy to use after stress, so individuals low on both attachment dimensions should be able to implement positive emotion regulation.

On the other hand, individuals higher on the anxious attachment dimension are typically poor emotion regulators (Mikulincer & Shaver, 2007), so this calls into question their ability to use positive emotion regulation. Unlike individuals lower on both attachment dimensions, individuals higher on the anxious dimension will not likely be motivated to attend to positive emotions after a stressor due to the fact that they are motivated to up-regulate negative emotions (Mikulincer & Shaver, 2007). If they intensify and prolong negative emotions, it is more likely that they will gain the desired attention of their caregiver or significant other. Further, a study that measured adult attachment, the Big Five personality traits, and specific positive emotions of joy, contentment, pride, love, compassion, amusement, and awe demonstrated that it is possible for individuals higher on the anxious attachment dimension to gain only specific types of positive emotions from relationships, such as compassion, but they do not derive the same types of rewards from the environment in the context of their intimate relationships as individuals lower on both attachment dimensions do (Shiota, Keltner, & John, 2006). Taken together, these findings suggest that individuals higher on the anxious attachment dimension have learned that positive emotions do not gain the desired
attention from their caregiver or significant other, and thus I suggest they will not likely have the experience with positive emotions or ability to use positive emotions to regulate negative emotions after stress.

Similarly, individuals higher on the avoidant attachment dimension are not successful at regulating their negative emotions (Mikulincer & Shaver, 2007). Individuals higher on the avoidant dimension may or may not be motivated and able to use positive emotion regulation and I theorize three possible patterns for these individuals.

First, they may successfully use positive emotion regulation because they are aiming to avoid negative emotions (Caldwell & Shaver, 2012) and want to latch on to anything that is not negative. If these individuals are presented with positive emotional stimuli after a stressor, they may pay attention to it in order to dodge the negative emotions that come from stress. Second, they may not successfully use positive emotion regulation because they avoid emotional information altogether (Gillath, Giesbrecht, & Shaver, 2009). There is evidence that individuals higher on the avoidance attachment dimension are more likely to have a lower skin conductance response to positive stimuli (Yee & Shiota, 2015), which suggests that these individuals do not likely attend to positive stimuli as readily as individuals who are low on both dimensions, and are therefore less likely to use positive emotion regulation after a stressor. Third, they may not successfully use positive emotion regulation because they down-regulate their emotions because emotions are undesirable, as these individuals do not have a consistent support system (Gillath, Bunge, Shaver, Wendelkin, & Mikulincer, 2005; Mikulincer & Shaver, 2003). Therefore, individuals who are higher on the avoidant attachment dimension may not acknowledge
any emotions that they encounter, as shown through the differences between physiological reactions and self-reported emotions (Quirin, Pruessner, & Kuhl, 2008).

Focusing on the differences between individuals higher/lower on the attachment dimensions, it seems clear that using positive emotion regulation may be useful to some individuals and not others. As previously reviewed, the general and simplified consensus is that individuals higher on the anxious or avoidant attachment dimension seem to be poor emotion regulators, while those lower on both dimensions are successful at emotion regulation (e.g., Mikulincer & Shaver, 2007). Due to the fact that individuals lower on both attachment dimensions are good at regulating their emotions after stress, likely to use emotion regulation strategies that decrease negative emotions, and have experience with benefits of positive emotions (Contreras & Kerns, 2000; Mikulincer & Shaver, 2007), it is possible that these individuals would also be able to use positive emotions as a regulation tool. On the other hand, individuals higher on the anxious attachment dimension may not use positive emotion regulation because they have learned that positive emotions do not garner the desired attention from the caregiver/significant other, so they do not have the motivation or experience with positive emotions to use positive emotion regulation. It is unclear if individuals higher on the avoidant attachment dimension will be able to use positive emotion regulation. They may use positive emotion regulation because they avoid negative emotional stimuli and may latch on to something positive, or they may not use positive emotion regulation because they avoid all potentially emotional stimuli or because they down-regulate their emotions.
THE CURRENT STUDY

The current study examined whether higher and/or lower scores on the anxious and avoidant attachment dimensions are predictive of the ability to use positive emotion regulation after a stressor. To assess positive emotion regulation, we used a task previously shown to successfully demonstrate which participants used positive emotions as a regulation tool after the stressor by inducing positive or neutral anticipation and measuring participants’ emotions and physiology before, during, and after the stressor (Monfort, Stroup, & Waugh, 2015). An advantage to using the anticipation of a positive event to induce positive emotions is this type of manipulation asks participants to use an internal motivation to recover from a stressor, as opposed to having participants respond to stimuli presented to them after a stressor. In order to induce positive or neutral anticipation, participants were shown funny and unfunny cartoons and told that they would see more cartoons from one of the decks at the end of the experiment. Participants were then asked to perform a mental arithmetic task (the stressor) and given time to recover. Physiological measures as well as self-reported emotions were taken in order to examine positive emotion regulation abilities during recovery.

The current study is building off a recent study that found that anticipating positive emotions predicted a decrease in negative emotions after the stressor, even past the baseline measure of negative emotion, which suggests that anticipating positive emotions gave participants a boost and enabled them to recover from the stressor (Monfort, Stroup, & Waugh, 2015). This study demonstrated that if the individual were to anticipate positive emotions, the problem of attempting to produce positive emotions directly after the stressor in order to mitigate the negative outcomes of the stressor could
be solved. However, a factor that was not examined in the Monfort, Stroup, and Waugh (2015) study was the participants’ attachment scores, so the present study incorporated attachment into anticipating positive emotions after a stressor.

‘Using emotion regulation’ is conceptualized in this study as a relatively automatic process that is generated by the individual’s internal processes and not through the instruction or suggestion of an outside source. ‘Successful positive emotion regulation’ as measured by self-report is defined as a significant decrease from baseline in unpleasantness ratings during early and late recovery and a significant increase from baseline in pleasantness ratings during early and late recovery. ‘Successful positive emotion regulation’ as measured by physiology is defined as a significant decrease from baseline in HR during early and late recovery as well as an increase from baseline in RSA during early and late recovery. Also, emotional responses to the positive and neutral stimuli were measured in case there were differences across attachment dimensions in whether participants enjoyed and preferred the funny cartoons to the unfunny cartoons. I chose to use the same measures for mood and the positive and neutral stimuli in the present study as they have been shown to be successful in the laboratory setting in previous studies (e.g., Monfort, Stroup, & Waugh, 2015).

I hypothesized that: a) individuals who are higher on the anxious or avoidant attachment dimensions would enjoy and prefer the funny cartoons more than the unfunny cartoons; b) individuals who are higher on the anxious attachment dimension would exhibit greater self-report stress responses (higher unpleasantness, lower pleasantness) and physiological stress responses (higher HR, lower RSA) during the stress task and would not successfully use positive emotion regulation during recovery as compared to
individuals who are lower on both dimensions; c) individuals who are higher on the avoidant attachment dimension may or may not successfully use positive emotion regulation during recovery as measured by self-reported emotions. Physiologically, however, these individuals would not successfully use positive emotion regulation.

Additionally if these hypotheses are supported, individuals who are lower on the anxious and avoidant attachment dimensions will successfully use positive emotion regulation during recovery.
METHOD

Participants

The total number of participants was 93 (52 male, 41 female) undergraduates who were recruited from the Introductory Psychology subject pool at Wake Forest University, ranging from 18-22 years of age ($M = 19.172$, $SD = 0.976$). Participants earned one credit for their participation. The Wake Forest University Institutional Review Board approved this study.

Materials

Attachment questionnaire. A 16-item continuous measure of general attachment style that is not specific to one relationship was used to measure whether participants were higher on the anxious or avoidant attachment dimension, or were lower on both dimensions (Berry, Wearden, Barrowclough, & Liversidge, 2006). Participants were asked to rate the extent to which each statement (e.g., ‘I tend to get upset, anxious, or angry if other people are not there when I need them’) applies to them on a four-point scale (from ‘not at all’ to ‘very much’). I averaged together items 1, 3, 5, 7, 9, 11, 13, and 15 for the anxiety subscale, with higher numbers meaning higher anxious attachment, and I averaged items 2, 4, 6, 8, 10, 12, 14, and 16 for the avoidance subscale, with higher numbers indicating higher avoidant attachment. (Note: items 6 and 10 are reverse scored). For the full measure, see Appendix 1. The internal reliability on the two dimensions of the attachment scale was acceptable in this study; the alpha for the anxiety subscale was 0.75 and alpha for the avoidance subscale is 0.63.

Positive and neutral stimuli. The positive and neutral stimuli were funny and unfunny single-panel cartoons, respectively, from The Cartoon Bank (Condé Nast
The cartoons have been used in previous studies and have been rated by Wake Forest University undergraduates as being funny or not funny (Monfort, Stroup, & Waugh, 2015; Waugh & Gotlib, 2008). The 40 cartoons that were rated the highest were chosen as the funny deck and the 40 cartoons that were rated the lowest were the unfunny deck. Also, it is important to note that in a pilot study, the unfunny cartoons were rated as ‘not particularly liked’ rather than ‘disliked’ (Monfort, Stroup, & Waugh, 2015). This demonstrates that the unfunny cartoons were neutral stimuli as opposed to negative stimuli. The decks were given an arbitrary name, either ‘LUM’ or ‘GUP,’ so as to avoid the possibility of confounding the results by using recognized names with pre-existing emotional meanings.

**Rating of positive and negative emotions.** Emotion ratings were gathered at four periods throughout the experiment (baseline, stress, early recovery, and late recovery). In this experiment, participants rated how “pleasant” (positive) or “unpleasant” (negative) they felt at that moment. The pleasant and unpleasant emotion ratings were presented on a visual analogue scale (ranging 0 – 1920 pixels), from the far left “not (un)pleasant” to the far right “very (un)pleasant.” The order that the participants saw the emotion rating questions was randomly generated on the first probe, either “pleasant” or “unpleasant.” Due to a programing error, all participants saw “pleasant” first and “unpleasant” second for the second through the fourth probe.

**Physiological reactions.** A physiological acquisition system (BIOPAC) was used to measure participants’ physiological reactions sampled at 1 kHz (BIOPAC MP150, AcqKnowledge; Biopac Systems, Goleta, CA). These data allowed for the assessment of physiological reactions to the stress task and recovery after the stress task was complete.
Specifically, I examined heart rate (HR) and RSA with electrocardiography (ECG). There were two electrodes placed on the participant’s lower rib on each side of the body and one below the collar bone in order to measure participants’ ECG. There were also sensors placed on the pad of the thumb and pinky finger to measure skin conductance and a respiration belt was placed around the participant’s torso. Only HR and RSA are examined in this paper.

**Procedure**

**Baseline measures.** First, the participants gave their consent to participate in this study. The Biopac sensors were attached to the participants’ lower ribs, below the collar bone, and non-dominant hand, and the respiration belt was placed around the participants’ torso. Then participants completed the attachment questionnaire on Qualtrics and rated their baseline pleasantness and unpleasantness after acclimating to the sensors during the five minute baseline period.

**Presentation of positive and neutral stimuli.** The first task was designed to examine if participants preferred the funny or unfunny cartoons more. In this task, participants viewed two cartoons side-by-side, 10 from the funny deck and 10 from the unfunny deck. Participants rated which of the two cartoons they preferred, on a 1-7 scale, 1 indicating the participant preferred the cartoon on the left, 4 indicating the participant did not prefer one cartoon over the other, and 7 indicating that the participant preferred the cartoon on the right. Second, each cartoon from the preference task was presented for six seconds each, for a total of two minutes. Participants rated each cartoon individually for their enjoyment of the cartoon. This rating was on a visual analog scale, 0 pixels indicating that the participant did not at all like the cartoon, a 30 pixel-wide area in the
center of the scale indicating that the participant neither liked nor disliked the cartoon, and 1920 pixels indicating the participant extremely liked the cartoon. The preference and enjoyment task were included in this study to explore any differences between participants higher/ lower on either or both attachment dimensions.

**Inducing anticipation of positive or neutral events.** Participants were then randomly assigned, via randomization in the E-prime program, to either the ‘LUM’ or ‘GUP’ condition (neutral or positive cartoon condition, respectively) and informed that they would see more of the cartoons from their assigned deck at the end of the experiment. After their assignment, they were asked to rate how excited they were to see the cartoons from their assigned deck. This rating was on a visual analog scale, 0 pixels indicating that the participant was not at all excited to see more cartoons from their assigned deck at the end of the experiment to 1920 pixels, indicating the participant was extremely excited to see more cartoons from their assigned deck at the end of the experiment. The assigned deck’s name was visible to the participant at the top right of the screen for the remainder of the experiment.

**Stressor task.** Participants were given a mental math serial subtraction task that is part of the Trier Social Stress task protocol (Kirschbaum, Pirke, & Hellhammer, 1993), but can also be used by itself as a stress task (Waugh, Muhtadie, Thompson, Joormann, & Gotlib, 2012). Participants were asked to subtract an odd number from a large number. In this case, the experimenter asked participants to, "Please count backwards from 4672 by 17s as quickly and as accurately as possible. Get as far as you can in the time given. If you make a mistake, you will be asked to start over. We will let you know when to stop. Please begin." After 90 seconds, participants rated their mood and the experimenter
looked away for privacy. This task continued for three minutes total. I chose the mental arithmetic task as the stressor because it is a social stressor, as the experimenter is present throughout the task and induces possible judgment by stopping the participant if they made a mistake. However, this stressor does not need to directly activate the attachment system, as previous work has demonstrated that even social stressors can activate the attachment system without having a relational stressor (e.g., Simpson & Rholes, 2012).

**Recovery.** After the stress period ended, the participants were again reminded that they would see cartoons from their assigned deck at the end of the experiment. Participants then sat quietly for three minutes and during this time, they rated their mood twice; once at 60 seconds, which denotes early recovery, and the second at 150 seconds, which denotes late recovery. There were two mood ratings take during recovery because in a previous study (Monfort, Stroup, & Waugh, 2015), the only difference between positive and neutral anticipation conditions was found in early recovery, not late recovery, I aim to explore if this study would replicate the pattern. Finally, the participants were shown 30 cartoons for six seconds each from their assigned deck for a total of three minutes. The sensors were taken off the participant’s torso and hand, and the participants were fully debriefed and thanked for their participation. This full experimental procedure took 40 minutes (Figure 2).
Analysis

Physiological processing. I used ANSLAB to analyze the physiological data. I first corrected the missing R-peaks for the ECG data and then converted this to interbeat intervals (IBI; or the time between beats). The natural log of the high frequency power (.15 to .4 Hz) was derived from the IBI and was taken as an index of parasympathetic tone (RSA; Berntson et al., 1997). The HR and RSA data were averaged at each minute of collection, producing 11 segments for analysis. Due to the fact that some of the participants had very noisy ECG data and therefore could not be analyzed, the number of participants that were able to be analyzed and reported on in the current study was $n = 62$. Also, because of the added R-peaks to the HR data, the RSA data was determined to not be reliable or usable due to the amount of noise, which reduced reliability of the RSA data. So, RSA was not used in final analyses of results and the results related to the HR and RSA should be interpreted with caution.

Self-report data. Each participant’s self-reported pleasantness and unpleasantness were subtracted from baseline at the time periods of stress, early recovery, and late recovery in order to best represent emotional return to baseline. These time periods that were subtracted from baseline were used in the analyses when appropriate.
In these analyses, I used Greenhouse-Geisser corrected degrees of freedom to address sphericity and protect against an inflated alpha level.
RESULTS

Manipulation Checks

**Positive stimuli.** First, I investigated whether participants preferred, enjoyed, and were more excited to see the cartoons from the funny deck more so than the unfunny deck. Consistent with expectations, a one-sample t-test showed that participants significantly preferred the funny cartoons to the unfunny cartoons when the cartoons were presented side-by-side on the computer screen ($M = 2.54, SD = 1.00$), $t(90) = -13.85$, $p < 0.001$. Also, according to a paired samples t-test, participants reported enjoying the cartoons from the funny deck ($M = 1398.17, SD = 427.61$) more than the cartoons from the unfunny deck ($M = 867.21, SD = 452.93$), $t(91) = 13.50$, $p < 0.001$. Finally, participants in the positive anticipation condition reported that they were significantly more excited to see cartoons from their assigned deck ($M = 1112.34, SD = 510.05$), than participants in the neutral anticipation condition were excited to see cartoons from their assigned deck ($M = 689.38, SD = 532.93$), $t(1, 89) = 14.92$, $p < 0.001$.

**Response to the stress task.** I used a paired-samples t-test to test whether participants would find that the stressor task was in fact stressful, meaning their mood ratings would significantly decrease in pleasantness and significantly increase in unpleasantness and HR when compared with the baseline mood and physiological ratings. Supporting the hypothesis, participants reported a significant decrease in pleasantness during the stress period ($M = 532.22, SD = 481.48$) compared to the baseline period ($M = 942.62, SD = 478.22$), $t(91) = 7.01$, $p < .001$. Participants also reported a significant increase in unpleasantness during the stress period ($M = 790.51, SD = 555.08$) compared to the baseline period ($M = 289.86, SD = 360.60$), $t(91) = -8.34$, $p < .001$. In relation to
physiology, the hypothesis was also supported, as participants’ HR significantly increased during the stress period ($M = 83.25, SD = 11.42$) in comparison to baseline ($M = 78.09, SD = 12.77$), $t(63) = -5.05, p < .001$.

**Attachment and Response to Positive Emotional Stimuli**

I used a regression to test the hypothesis (1) that a higher score on the anxious or avoidant attachment dimensions would predict a lower preference score, meaning a preference for funny cartoons. In contradiction to the hypothesis, the preference score was not predicted by the anxious attachment dimension, $B = -0.10, t(90) = -0.92, p = 0.36$. However in support of the hypothesis, the avoidant attachment dimension did predict the preference score, $B = 0.25, t(90) = 2.33, p = 0.02$, and so did the interaction of anxious and avoidant attachment, $B = 0.20, t(90) = 2.41, p = 0.02$. When deconstructing this significant interaction of anxious and avoidant attachment, simple slope analysis showed that for high anxious participants (+1 SD), lower avoidance did not significantly predict preference, $B = 0.045, t(90) = -0.37, p = 0.71$. For low anxious participants (-1 SD), higher avoidance significantly predicted preferring the funny cartoons more than the unfunny cartoons, $B = 0.446, t(90) = -3.05, p = 0.003$ (see Figure 3). These findings suggest that participants who were high on one or both of the dimensions preferred the funny cartoons over unfunny cartoons more so than participants who were low on both dimensions. However, when I used regression to explore whether the anxious attachment, avoidance attachment, or the interaction of the two dimensions predicted the difference score of enjoyment of funny minus unfunny cartoons, I found that anxious attachment, $B = -24.52, t(90) = -0.58, p = 0.56$, avoidance attachment, $B = -24.39, t(90) = -0.58, p = 0.56$, and their interaction, $B = 26.05, t(90) = 0.80, p = 0.43$, did not predict the enjoyment of
cartoons. Also using regression, I found the same pattern for anticipation of the assigned cartoons such that anxious attachment, $B = 92.61$, $t(90) = 1.48$, $p = 0.14$, avoidant attachment, $B = -37.48$, $t(90) = -0.61$, $p = 0.55$, and their interaction, $B = -36.29$, $t(90) = -0.75$, $p = 0.46$, did not predict anticipation of cartoons. This pattern of results showed that participants low on both attachment dimensions preferred funny cartoons less than participants high on the anxious and avoidant attachment dimensions; however, when further analyses were done, the results suggest that this pattern for the attachment dimensions does not hold for the other measures of positive emotional responses to these positive stimuli. Therefore, these results should be interpreted with caution.

Figure 3: Anxious and Avoidance Attachment Dimensions Predicting Preference Score

![Graph showing the interaction between anxious and avoidance attachment predicting preference score](image)

*Fig. 3.* Interaction between anxious and avoidance attachment predicting preference score, where a lower score is predictive of preferring funny cartoons.

**Using Positive Emotion Regulation**
I expected that participants who were lower on both attachment dimensions would successfully use positive emotion regulation to recover. When I ran 2 (Induction Condition: positive, neutral) x 3 (Time Period: stress, early recovery, late recovery) mixed ANOVAs with induction condition as the between-subjects variable, time period as the within-subjects variable, and mood ratings (pleasant and unpleasant in separate models) as the dependent variables, the analysis yielded a main effect of time period on pleasantness mood ratings, $F(1.81[2], 162.79[180]) = 7.44, p = .001$, using the Greenhouse-Geisser corrected degrees of freedom. Pairwise comparisons yielded that participants significantly increased in pleasantness between stress and late recovery, $t(90) = 3.39, p = 0.003$, and between early and late recovery, $t(90) = 2.77, p = 0.021$. This demonstrates that overall, participants significantly increased in pleasantness between stress and late recovery, as well as from early to late recovery. However, participants did not fully recover from the stressor; that is, they did not return to baseline self-reported emotions, as reflected by the significant difference between baseline and both recovery time periods, $t(91) = 12.42, p < 0.001$. Contrary to my expectations, the results did not yield a significant interaction of time period and condition, $F(1.81[2], 162.792[180]) = 0.547, p = 0.580$, signifying that overall, there was not a difference between participants in the positive and neutral anticipation conditions in their pleasantness ratings.

Likewise, analysis examining unpleasantness ratings yielded only a significant main effect of time period, $F(1.72[2], 154.59[180]) = 23.647, p < 0.001$. Pairwise comparisons showed that participants significantly increased from stress to early recovery, $t(90) = 2.90, p = 0.014$, between early and late recovery, $t(90) = 4.89, p < 0.001$, and between stress and late recovery, $t(90) = 5.85, p < 0.001$. However, participants did not
fully recover as shown by their lack of return to baseline, $t(91) = 12.30, p < 0.001$. Again, there was not a significant interaction of time period and condition, $F(90) = 0.62, p = 0.54$. These findings suggest that overall, the average participant did not successfully use positive emotion regulation in terms of mood ratings, as there was no difference between participants in the positive and neutral anticipation conditions in either the pleasantness or unpleasantness ratings.

In order to test the expectation that participants in the positive anticipation condition, as compared to the neutral anticipation condition, had an increase in HR during stress and a subsequent decrease during the two recovery time periods, I first conducted a one-way ANOVA with HR data (yes, no) as the between-subjects variable, and self-reported pleasantness and self-reported unpleasantness at each time point (baseline, stress, early recovery, late recovery) as the dependent variable to ensure there were no differences between participants who had HR data and those who did not. Participants with and without HR data significantly differed at two time points, self-reported unpleasantness during stress, $F(1, 91) = 4.15, p = 0.05$, and self-reported unpleasantness during early recovery, $F(1, 91) = 5.32, p = 0.02$, where participants with HR data reported significantly higher unpleasantness during these time points.

I then ran a 2 (Induction Condition: positive, neutral) x 3 (Time Period: mean baseline, mean stress, mean recovery) mixed ANOVA with induction condition as the between-subjects variable and HR in each time period as the within-subjects variable. The analysis yielded a significant main effect of time period, $F(1.79[2], 107.15[120]) = 34.53, p < 0.001$. Pairwise comparisons between time periods showed that participants’ HR increased from baseline to stress, $t(60) = -5.43, p < 0.001$, and decreased from stress
to recovery, \( t(60) = 7.43, p < 0.001 \), and that their HR decreased below baseline during recovery, \( t(60) = -2.60, p = 0.035 \), meaning participants recovered from stress. Again however, analysis did not yield a significant interaction of time period and condition, \( t(60) = 1.99, p = 0.15 \). The pattern of findings from pleasantness, unpleasantness and HR suggest that participants do not significantly differ in these variables between the positive and neutral anticipation conditions. In other words, the average participant did not successfully use positive emotion regulation to recover from the stressor.

**Differences in using positive emotions in recovery due to attachment.** I next tested the hypothesis (2) that participants who were higher on the anxious attachment dimension would not successfully use positive emotion regulation. I also tested the competing hypotheses (3) that participants higher on the avoidant attachment dimension may or may not use positive emotion regulation successfully. In order to test these hypotheses, I ran a 2 (Induction Condition: positive, neutral) x 3 (Time Period: stress, early recovery, late recovery) ANCOVA with anxious attachment, avoidant attachment and their interaction as covariates of interest and were allowed to interact with the between- and within-subject factors and self-reported pleasantness as the dependent variable. This analysis yielded a significant main effect of time period, \( F(1.79[2], 150.73[168]) = 7.46, p = 0.001 \). There was not the expected interaction of time period by condition, \( F(1.79[2], 150.73[168]) = 0.52, p = 0.59 \). Further, the hypothesis (2) that participants with a higher score on the anxious attachment dimension would not successfully use positive emotion regulation was not supported, as there was not a significant interaction of time period by condition by anxious attachment, \( F(1.79[2], 150.73[168]) = 0.75, p = 0.48 \). Likewise, the hypothesis (3) that participants with a
higher score on the avoidant attachment dimension may or may not use successful positive emotion regulation was not supported, as there was not a significant interaction of time period by condition by avoidant attachment, $F(1.79[2], 150.73[168]) = 0.44, p = 0.78$.

I next ran the same analyses with unpleasantness as the dependent variable. This analysis yielded a significant main effect of time period, $F(1.72[2], 144.68[168]) = 22.64, p < 0.001$. Relevant to my hypotheses, there was not a significant three-way interaction of time, condition, and anxious attachment, $F(1.72[2], 144.68[168]) = 0.62, p = 0.54$. Also relevant to my hypothesis, there was not a significant three-way interaction of time, condition, and avoidant attachment, $F(1.72[2], 144.68[168]) = 0.84, p = 0.43$.

However, there emerged a significant interaction of condition, anxious attachment, and avoidant attachment, $F(1, 84) = 4.68, p = 0.033$. In order to examine this interaction, I first averaged unpleasantness across time periods because there was no significant interaction with time. Figures 4 and 5 depict the interaction of condition and the attachment dimensions separately.
Figure 4: Interaction of Anxious *Avoidant Attachment Dimensions Predicting Average Unpleasantness in the Positive Anticipation Condition

*Fig. 4.* Positive anticipation for the interaction of anxious and avoidant attachment predicting average unpleasantness.

Figure 5: Interaction of Anxious*Avoidant Attachment Dimensions Predicting Average Unpleasantness in the Neutral Anticipation Condition

*Fig. 5.* Neutral anticipation condition for the interaction of anxious and avoidant attachment predicting average unpleasantness.
Next, I explored this three-way interaction by conducting regressions with unpleasantness as the dependent variable predicted by anxious attachment, avoidant attachment and their interaction separately for each induction condition. This analysis yielded a significant interaction of anxious and avoidant attachment predicting unpleasantness in the neutral anticipation condition, $B = -200.51$, $t(47) = 2.96$, $p = 0.005$. Simple slope analysis of the two-way interaction in the neutral condition showed that for high anxious participants (+1 SD), higher avoidance significantly predicted decreased unpleasantness, $B = -208.90$, $t(47) = -2.33$, $p = 0.03$. For low anxious participants (-1 SD), however, higher avoidance significantly predicted increased unpleasantness, $B = 192.13$, $t(43) = 2.13$, $p = 0.04$. This pattern of results, in addition to the lack of main effects for anxious and avoidant attachment and with visual inspection of Figure 6, suggests a crossover interaction such that for the neutral condition, participants who were low or high on both subscales (e.g., high anxious, high avoidance or low anxious, low avoidance) reported less unpleasantness than participants who were high on one dimension and low on the other (i.e., high anxious, low avoidance or low anxious, high avoidance). However, the analysis did not yield a significant interaction of anxious and avoidant attachment predicting unpleasantness in the positive anticipation condition, $B = -13.19$, $t(47) = -0.26$, $p = 0.79$. This suggests that anticipating a positive event may eliminate the effect of individual differences in these attachment dimensions on stress-related negative emotions.
In order to test the hypotheses that participants higher on the anxious and/or avoidant attachment dimensions would be less likely to physiologically recover from stress than participants lower on the attachment dimensions, I conducted a 2 (Induction condition: positive, neutral) x 2 (Time Period: stress, recovery) ANCOVA with the continuous variables of anxious and avoidant attachment and the interaction of anxious and avoidant as covariates of interest and were allowed to interact with induction condition as the between-subjects variable, time period as the within-subjects variable, and HR as the dependent variable. There was the expected significant main effect of time period, $F(1, 54) = 54.29, p < 0.01$. Contrary to the hypothesis, the interaction of time period and anxious attachment, $F(1, 54) = 0.01, p = 0.91$, was not significant suggesting that anxious attachment did not have an effect on HR. Further, related to the hypothesis for individuals higher on the avoidant attachment dimension, the interaction of time period and avoidant attachment was not significant, $F(1, 54) = 1.32, p = 0.26$; avoidant
attachment was also not related to differences in physiological responses to and recovery from stress.
DISCUSSION

Past research on attachment and emotion regulation suggests that individuals higher on the anxious and/or avoidant attachment dimensions are poor emotion regulators and do not process or respond to positive emotions in the same way as individuals lower on both attachment dimensions (e.g., Mikulincer & Shaver, 2007). The purpose of this study was to test whether the dimensions of anxious and avoidant attachment predicted the use of positive emotion regulation after stress.

The results of the current study did not support my hypotheses. There was not an interaction of condition and time period; this finding means that on average, participants did not succeed at positive emotion regulation during recovery and was contrary to previous research (Monfort, Stroup, & Waugh, 2015). Further, contrary to my hypotheses, there were not significant interactions of time period, condition, and either attachment dimension, which means that individuals higher on the anxious or avoidant attachment dimension, no matter the condition, were not different in their use of emotion regulation during any specific time period than individuals lower or higher on both dimensions. These findings were surprising given past research; because individuals higher on either of the attachment dimensions are not typically good emotion regulators (e.g., Mikulincer & Shaver, 2007), it follows that the dimensions would predict the use of positive emotion regulation after stress. Instead, the predicted interactions were not found. These results demonstrate that my hypotheses were not supported as well as demonstrate that individuals lower on both attachment dimensions did not successfully use positive emotion regulation during recovery. I may not have supported my hypotheses because the stressor was not a relational stressor; that is, the stressor did not
necessarily directly activate the attachment system and instead was a general social stressor. Previous studies have demonstrated that even social stressors can activate the attachment system (Simpson & Rholes, 2012), but perhaps this stressor did not activate the attachment system as I hoped. Future studies may benefit from having a stressor that directly activates the attachment system and therefore may find the hypothesized interactions.

Although my hypotheses for higher anxious attachment only and higher avoidant attachment only were not supported, my results suggest that the two attachment dimensions do not operate independently, but instead interact with each other as well as with condition. Specifically, I found a surprising, yet interesting, crossover interaction between anxious and avoidant attachment in the neutral condition predicting unpleasantness scores such that participants who were lower or higher on both dimensions (i.e., higher anxious, higher avoidance or lower anxious, lower avoidance) reported less unpleasantness than participants who were high on one dimension and low on the other (i.e., higher anxious, lower avoidance or lower anxious, higher avoidance). In the positive anticipation condition, however, the interaction was erased. There are no studies, to my knowledge, that have found the pattern of results in the present study.

It is interesting that time point did not interact with condition and the attachment dimensions. This result means that generally, participants regulated their overall stress response, as opposed to regulating during only the recovery time point. More specifically though, participants who were higher or lower on both dimensions regulated their overall stress response in both conditions; they were not more successful at regulation in the positive anticipation condition in relation to the neutral anticipation condition. This
crossover interaction also suggests that the attachment dimensions did not operate independently as originally hypothesized; some participants (higher or lower on both attachment dimensions) do seem to regulate their emotions naturally, but not by using positive emotion regulation to recover after stress in this study. This implies that positive emotion regulation specifically may not be as useful to participants who were higher or lower on both attachment dimensions because they did not need the added positive emotion boost to regulate their emotions.

On the other hand, participants higher on one dimension and lower on the other reported less unpleasantness in the positive anticipation condition than they did in the neutral anticipation condition. This suggests that these participants regulated their overall stress response with positive emotions, but it was not specific to the recovery time point. These results imply that positive emotion regulation may have helped individuals higher on the anxious or avoidant attachment dimension and low on the other, as these participants’ unpleasantness was likely to be lower in the positive anticipation condition as opposed to the neutral anticipation condition.

**Neutral Anticipation Condition**

Why would participants who were higher on both attachment dimensions report the same levels of unpleasantness as participants who were lower in both attachment dimensions in the neutral anticipation condition? A reason for this pattern in the neutral anticipation condition may be that although individuals who are higher on both attachment dimensions should be faced with the double whammy of the tendency to up-regulate negative emotions as well as wanting to avoid these negative emotions, the two competing strategies may not be detrimental when paired. In other words, when an
individual is higher on both the anxious and avoidant attachment dimensions, the high avoidant tendencies may help regulate the higher anxious and neurotic tendencies. Previous studies have found that higher avoidant attachment may prevent the constant up-regulation of negative emotions when neuroticism is also higher, so higher avoidance is suggested to be an emotion regulation strategy (Crawford, Shaver, & Goldsmith, 2007). So, a proposed reason that individuals higher on both attachment dimensions may naturally regulate their emotions is because adding higher avoidant attachment to higher anxious attachment may diminish the competing anxious versus avoidant emotion regulation tendencies instead of exacerbating them. Therefore, these individuals may be able to regulate emotions similarly to the individuals low on both attachment dimensions. This may be a place in the experiment where a relationship stressor, as opposed to a general social stressor, could delineate between individuals low on both dimensions and those high on both dimensions. Future research should explore this potential difference in the attachment dimensions.

Further, individuals higher on one dimension and lower on the other were more likely to report more unpleasantness in the neutral anticipation condition than individuals lower or higher on both dimensions. This pattern of findings is somewhat in line with previous research. Individuals who are higher on the anxious attachment dimension and lower on the avoidant dimension are likely to up-regulate negative emotions (unpleasantness) to gain the attention of their caregiver or significant other who has been inconsistent in the past (Mikulincer & Shaver, 2007). It follows that the results demonstrate that these individuals were likely to report more unpleasantness than individuals higher or lower in both dimensions because in the past it has been beneficial.
for individuals higher in only the anxious dimension to continue reporting more unpleasantness.

The result that individuals who are higher on the avoidant dimension and lower on the anxious dimension were also likely to report more unpleasantness than individuals lower or higher on both dimensions is surprising as these individuals typically report their emotions just as the individuals who are lower on both dimensions do (Quirin, Pruessner, & Kuhl, 2008). It is possible that unpleasantness may be different for individuals who are lower anxious, higher avoidant and higher anxious, lower avoidant (dismissive and pre-occupied categories, respectively; see Figure 1). Individuals who are lower anxious, higher avoidant (dismissive) may be reporting higher unpleasantness because they are experiencing unpleasantness due to being in the laboratory setting and being asked to do menial tasks. On the other hand, perhaps individuals who are higher anxious, lower avoidant (pre-occupied) up-regulate negative emotions to gain attention as previously discussed. Also, it is possible that this result was due to chance and will not replicate in future studies.

Positive Anticipation Condition

I found that the interaction between anxious and avoidant attachment was erased in the positive anticipation condition. By examining the simple slopes in Figure 6, it seems that anticipating a positive event wipes out the effect of the attachment dimensions on unpleasantness and puts all participants on a level emotion regulation playing field. This finding was in direct contrast with the current findings in the neutral anticipation condition. These results also suggest that positive emotion regulation actually helped individuals who needed it, although I did not hypothesize this. Why would the
interaction between the anxious and avoidant attachment dimensions found in the neutral anticipation condition disappear when participants were in the positive anticipation condition? Why did positive anticipation only work for those who needed it (i.e., high on one attachment dimension and low on the other), but not further aid individuals at the extremes of the dimensions?

This finding could be due to the fact that giving individuals a specific positive event to look forward to may make them higher in resilience in a certain context and thus, have less overall unpleasantness in that same context. Previous research has found that individuals with higher trait resilience before the 9/11 terrorist attacks were less likely to experience depressive symptoms post 9/11 (Fredrickson, Tugade, Waugh, & Larkin, 2003). Additionally, this relationship was mediated by positive emotions, suggesting that the ability to experience positive emotions was one of the possible reasons that resilient individuals were able to better recover after the stressor. As previously reviewed, positive emotions broaden and build cognitions and attention (Fredrickson & Levenson, 2003) and therefore, positive emotions may lead certain individuals to use effective coping strategies (Waugh, 2014). However, individuals higher on the anxious attachment dimension are less likely to perceive or receive the same boost in positive emotions as individuals lower on both attachment dimensions do (Shiota, Keltner, & John, 2006), while individuals higher on the avoidant attachment dimension are less likely to perceive positive emotions (Kafetsios, Andripoulos, & Papachiou, 2014) or produce positive emotions (Djoric & Medjedovic, 2011). Furthermore, previous research has shown that those higher on the anxious or avoidant attachment dimension, as opposed to those low on both dimensions, are less resilient (Fraley & Bonanno, 2004; Kobak & Sceery, 1988).
However, the current study did not show the lack of positive emotional responding for the avoidant attachment dimension or that individuals higher on only the anxious attachment dimension did not perceive the positive emotions. This suggests that anticipating a positive event may operate in the same way as resilient individuals’ ability to use positive emotions to regulate; by anticipating positive events, there may be an increase in individuals’ resources to deal with the stressor. Thus, individuals who were higher on one attachment dimension and lower on the other may gain some of the benefits of positive emotions because they also have the ability to think of more possible ways to deal with the stressor at hand. Essentially, anticipating a positive emotion may even out the playing field of emotion regulation abilities in relation to individuals’ reported experience of negative emotions.

Taken together, these findings suggest that it is possible that anticipating a positive event may have reduced unpleasantness for participants who were having the toughest time with the stressor—those who were high on one dimension and low on the other. Although participants higher on either the anxious or avoidant attachment dimension have less experience with positive emotions, when individuals are given a tangible positive event to look forward to, the positive emotions from this anticipation may carry through the stressor and recovery leading to a level playing field between the attachment dimensions.

**Physiologically Measuring Stress and Recovery**

Overall, participants’ HR increased during the stress induction and decreased during recovery; participants were stressed and then recovered back to baseline, which is in line with previous research and my hypotheses (Diamond & Hicks, 2005; Maunder,
Lancee, Nolan, Hunter, & Tannenbaum, 2006). The interesting question is why was there a three way interaction of condition and both attachment dimensions on unpleasantness, but not with HR? As previously reviewed, research has demonstrated differences between individuals higher and/or lower on the attachment dimensions in physiological outcomes during and after stress. Individuals who are lower on both dimensions have an increase in HR during stress and a decrease in HR during recovery (Diamond & Hicks, 2005), while individuals higher on the anxious or avoidant attachment dimension have an increase in HR during stress and their HR remains elevated (Quirin, Pruessner, & Kuhl, 2008; Roisman, 2007). In the current study though, there was no difference between attachment dimensions, meaning on average participants’ HR increased during stress and decreased during recovery. Further, there was no difference between the positive and neutral anticipation condition, meaning when participants were anticipating the positive or neutral cartoons, the cartoons did not have a differing effect; participants’ HR increased during stress and decreased during recovery, no matter the condition.

The lack of interaction of condition and the attachment dimensions are not in line with previous research. Past studies have found differences in HR during stress and during recovery for individuals higher or lower on the attachment dimensions. Specifically, individuals higher on the anxious attachment dimension have a significantly higher HR during stress and their HR stays elevated during recovery (Roisman, 2007). Individuals who are higher on the avoidant attachment dimension report that they increase in unpleasantness during stress and subsequently decrease in unpleasantness during recovery, but their HR significantly rises during stress and does not decline during
recovery, so there is a disconnect between their self-reported emotions and their physiological reactions to stress (Quirin, Pruessner, & Kuhl, 2008).

Additionally, it is possible that this decrease may be due to expected or anticipated effort. Previous studies have shown that anticipated effort can have a large impact on physiology such that when the task was difficult, there was more expected effort and a higher HR (e.g., see Gendolla, Wright, & Richter, 2012), especially when the task was highly relevant to the participants’ identity (Gendolla, 1998). In the present study, the mental arithmetic task was difficult and it could be seen as relevant to the participants’ identity as a student. Therefore, the anticipated effort of doing the mental arithmetic task may have been a reason for the increased HR. The decrease in HR during recovery may have been due to effort no longer being needed when the task ended and not due to self-reported emotions or anxiety. Indeed, studies have shown that when participants believe they will have to do a task in the future, their HR increases when they are told they do not have to complete the task and thus, the stressor is over and their HR decreases (Heslegrave & Furedy, 1976). So, the anticipation of effort of doing a task is enough to increase participants’ HR as if they had done the task. Future studies should attempt to parse apart anticipated effort from the emotionally driven physiology, as this could demonstrate the mechanism by which HR increases during stress.

Further, the fact that there was a significant difference in self-reported unpleasantness during stress and early recovery between participants with and without HR data shows that these results should be interpreted with caution. It is possible that participants with HR data had more exaggerated HR differences between the time periods and that is why they had more reliable HR data as compared to the participants’ HR data
that was unreliable. It is possible that if all participants had HR data, the results may be consistent with the results of the study, but it is also possible that the results may have supported the hypothesis. Future studies should continue to examine HR data as researchers have shown that HR is an important measurement to delineate differences between attachment dimensions.

Conclusion

This study has interesting results and addresses a current gap in the literature in relation to how attachment theory fits into using positive emotion regulation after a stressor. This study found that participants high or low on both attachment dimensions do seem to regulate their emotions naturally. Importantly, positive emotion regulation may have aided individuals higher on one attachment dimension and low on the other, as these participants’ unpleasantness was likely to be lower in the positive anticipation condition as opposed to the neutral anticipation condition. I did not, however, replicate the findings of Monfort, Stroup, and Waugh (2015) perhaps because of the mismatch between stressor and anticipated event, so future studies should aim to match the intensity of the stressor to the intensity of the positive event. Further, future studies should also dig deeper into the simple slope findings by testing potential moderators that may have an effect on how individuals use positive emotion regulation after a stressor.
REFERENCES


Appendix A

PAM

1. I tend to get upset, anxious, or angry if other people are not there when I need them.
2. I prefer not to let other people know my ‘true’ thoughts and feelings.
3. I worry that key people in my life won’t be around in the future.
4. I find it easy to depend on other people for support with problems or difficult situations.
5. I ask other people to reassure me that they care about me.
6. I usually discuss my problems and concerns with other people.
7. If other people disapprove of something I do, I get very upset.
8. I find it difficult to accept help from other people when I have problems or difficulties.
9. I worry that if other people get to know me better, they won’t like me.
10. It helps to turn to other people when I’m stressed.
11. I worry a lot about my relationships with other people.
12. When I’m feeling stressed, I prefer being on my own to being in the company of other people.
13. I worry that if I displease other people, they won’t want to know me anymore.
15. I worry about having to cope with problems and difficult situations on my own.
16. I feel uncomfortable when other people want to get to know me better.
CURRICULUM VITAE

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EDUCATION

2013-present  Wake Forest University
M.A., Psychology (in progress)
3.712 GPA

2009-2013  Furman University
B.S., Psychology
3.257 GPA

PUBLICATIONS


TALKS

Stroup, H. (2014, October). When looking to the future is not effective: The role of attention and attachment in using positive anticipation as an emotion regulation tool. Talk given at the Seminar in Self-Regulation, Wake Forest University, Winston-Salem, NC.


PRESENTATIONS


**GRANTS AND AWARDS**

2014  Wake Forest Alumni Travel Grant, $300  
*Funding to attend the Society for Personality and Social Psychology 2014 Annual Conference*

2014  Wake Forest Summer Research Grant, $1000  
*Planned and designed future research at Wake Forest University, Winston-Salem, NC*

2012  Furman Advantage Intern Fellowship, $2500  
*Managed a meta-analysis at the Biopsychosocial Lab at Ryerson University, Toronto, Ontario*

2011  Furman University Travel for Student Conferences Award, $350  
*Funding to attend the Society for Southeastern Social Psychologists 2011 Annual Conference*

2011  Furman Advantage Research Grant, $3000  
*Designed, planned, and carried out an independent research project under the supervision of Dr. Michelle Horhota*

**RESEARCH INTERESTS**

Adoption  
Parent-child attachment, attachment disorders  
Intervention  
Resilience and recovery from stressful life events
TEACHING EXPERIENCE

Fall 2014-present  
Wake Forest University  
Graduate Teaching Assistant  
Psychology 357: Cross Cultural Psychology (Dr. Deborah Best)  
Psychology 255: Personality Psychology (Dr. Dustin Wood)  
Psychology 248: Cognitive Psychology (Dr. Alycia Silman)

Spring 2013  
Furman University  
Teaching Assistant  
Psychology 111: General Psychology (Dr. Beth Pontari)

2009-2010  
America Reads America Counts tutor

HONORS

2013  
Psychology Department Prevost Award, Furman University  
Dean’s List, Furman University

RESEARCH EXPERIENCE

2014-present  
Wood Personality Lab, Wake Forest University (Dr. Dustin Wood)  
Graduate research assistant  
Designed research survey via Qualtrics, assisted in the design and carrying out of a project examining how to characterize appraisal patterns of emotions and the types of events may lead to a specific emotion and the behavioral outcomes of the emotion

2013-present  
Emotion Lab, Wake Forest University (Dr. Christian Waugh)  
Graduate student  
Designed, planned, and carried out research projects examining role of parent-child attachment in anticipation of positive emotions, emotion regulation, anticipation of positive emotions, and recovery from stressors

2011-2013 Horhota  
Social Cognition and Aging Lab, Furman University (Dr. Michelle Horhota)  
Research assistant  
Designed, planned, and carried out a research project examining the effects of aging expectations of physical activity under the supervision of Dr. Michelle Horhota
Summer 2012 Biopsychosocial Lab, Ryerson University, Toronto, Ontario (Dr. Leslie Atkinson)
Research assistant
Managed a meta-analysis on the effects of maltreatment in childhood and cortisol levels in children and adults

SERVICE
Summer, 2014 Special Children’s School, Teaching assistant volunteer, Winston-Salem, NC
2012-2013 Psychology Club President, Furman University
2010-2013 Psychology Club, Furman University
2011 Autism Connection volunteer, Greenville, SC

INTERNSHIP
Fall, 2012 Marshall Pickens Psychiatric Hospital
Observed clinical interviews with patients of all ages
Observed, administered, and scored psychological and neuropsychological testing for patients of all ages

PROFESSIONAL AFFILIATIONS
2014-present Association for Behavior and Cognitive Therapy
2013-present American Psychological Science
2013-present Society for Personality and Social Psychology