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The Independent Contributions of Social Reward and Threat Perceptions to Romantic Commitment

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Although separate literatures have emerged on effects of social threats (i.e., rejection and negative evaluation) and rewards (i.e., connection and intimacy) on the process of commitment to a romantic relationship, no research has examined the influence of both simultaneously. Using an attachment framework, we examined the relation of social threats and rewards to investment model constructs (i.e., commitment, satisfaction, investment, quality of alternatives) in 3 studies. Study 1 ($N = 533$) and Study 2 ($N = 866$) assessed attachment styles, reward and threat perceptions, and investment model constructs, and data were analyzed using structural equation models. In Study 3 ($N = 358$), reward and threat perceptions were experimentally manipulated followed by measurement of investment model constructs. Results showed that attachment avoidance was uniquely associated with lower perceptions of reward, whereas attachment anxiety was uniquely associated with stronger perceptions of threat. Stronger reward perceptions were associated with higher commitment, investment, and satisfaction, as well as lower quality of alternatives in all studies. Stronger threat perceptions were associated with lower satisfaction in all 3 studies. Stronger threat perceptions were also correlated with higher levels of investment and commitment, although these effects did not replicate in our experimental study. Thus, perceptions of reward appear unambiguously associated with higher levels of all facets of commitment, whereas perceptions of threat are most strongly associated with lower satisfaction. These results underscore the importance of considering the effects of rewards and threats simultaneously in commitment processes.

Keywords: adult attachment, investment model of commitment, romantic relationships, social reward, social threat

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In considering the regulation of behavior in close relationships, research has tended to focus individually on the motivating power of threats such as negative evaluation and rejection (e.g., Murray & Holmes, 2009; Murray, Holmes, & Collins, 2006) or rewards such as connection and intimacy (e.g., Aron, Norman, Aron, McKenna, & Heyman, 2000). Thus, little is known about the relative contribution of perceptions of threats and rewards to important relationship outcomes. In the current research, we integrate theoretical perspectives on attachment security, the investment model of commitment, and our reward–threat perspective to examine the ability of social threat and reward perceptions to

predict an outcome highly relevant to the long-term stability of relationships: commitment. Specifically, we outline and test a model wherein attachment avoidance is associated with lower perceptions of reward in romantic relationships, which in turn predict lower relationship commitment. The model further posits that attachment anxiety is associated with higher perceptions of threat, which in turn are associated with processes that both facilitate and impede relationship commitment.

Investment Model of Commitment

Romantic relationships have the potential to satisfy deep needs for intimate social connection (Baumeister & Leary, 1995; Gere & MacDonald, 2010). However, most romantic relationships do not last a lifetime. Once a relationship is established, a vital contributor to its stability is the partners' level of commitment to the relationship (Le & Agnew, 2003; Rusbult, 1980; Rusbult, Martz, & Agnew, 1998). Relationship commitment has been defined as the intention to stay with a partner for the long term (Rusbult, 1980, 1983). A lack of commitment has been found to be a strong predictor of relationship dissolution (Le & Agnew, 2003; Rusbult, 1980). In addition to predicting the length of a relationship, commitment is related to many indicators of relationship quality. For example, commitment has been found to be associated with responding to a partner's negative behaviors with relationship-maintaining rather than destructive behaviors (Rusbult, Verette,

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Whitney, Slovik, & Lipkus, 1991), motivation to believe that one's relationship is better than other people's relationships (Rusbult, Van Lange, Wildschut, Yovetich, & Verette, 2000; Van Lange & Rusbult, 1995), cognitive interdependence (Agnew, Van Lange, Rusbult, & Langston, 1998), and other pro-relationship behaviors (Wieselquist, Rusbult, Foster, & Agnew, 1999). Commitment is also associated with a willingness to endure costs for the relationship, such as the willingness to make sacrifices for the good of the partner (Van Lange et al., 1997) and the willingness to forgive a partner's transgressions (Finkel, Rusbult, Kumashiro, & Hannon, 2002). These findings indicate that commitment plays an important role in close relationships and is associated with many processes that promote relationship happiness and success.

The investment model of commitment is the most strongly supported theoretical framework for understanding the factors that promote commitment to a relationship (Rusbult, 1980, 1983; Rusbult & Buunk, 1993). According to this model, higher commitment is facilitated by higher relationship satisfaction (i.e., the extent to which outcomes exceed expectations) and greater investment in the relationship (i.e., the extent to which resources have been placed into the relationship that would be lost if the relationship were to end), whereas commitment is lowered by having good quality of alternatives to the relationship (i.e., the extent to which other relationships or being single may also meet one's needs). A meta-analysis of the associations between the investment model constructs showed consistent support for the theory (Le & Agnew, 2003). Higher satisfaction, greater investments, and lower quality of alternatives each explained unique variance in commitment, showing that although they are related concepts, they also contribute independently to commitment.

The Regulation of Relational Commitment

Given the central role that commitment plays in shaping the quality and stability of relationships, understanding the factors that influence commitment to a romantic partner is important. In the current article, we focus on the contributions of perceptions of social threats and opportunities for social reward to romantic commitment. Social threats refer to concerns about negative evaluation and rejection by a relationship partner (Murray & Holmes, 2009; Spielmann, MacDonald, & Tackett, 2012) and social rewards refer to opportunities for intimacy and connection (Spielmann et al., 2012). The absence of threats and the presence of rewards are both important in fulfilling relational needs (Impett et al., 2010; Spielmann et al., 2012) and are likely to make independent contributions to commitment given that they represent independent dimensions of experience (Gray & McNaughton, 2000).

Commitment Processes and Social Threat

The importance of social threat in the commitment process has been emphasized in several existing lines of research. Social threats have been theorized to play an essential role in the establishment of trust between relationship partners (for a review, see Simpson, 2007). When people trust their partner, they have confidence that their partner will be responsive to their needs (Murray & Holmes, 2009; Simpson, 2007). Trust between partners is essential in the early stages of a relationship, as it provides a sense of safety when opening up emotionally to a partner (Murray &

Holmes, 2009; Murray et al., 2006; Simpson, 2007). Perceptions of low threat are important to the establishment of trust, because feeling that one does not need to be concerned about potential negative evaluation and rejection from the partner serves as a signal that the partner can be trusted (Murray et al., 2006; Simpson, 1990, 2007).

Risk regulation theory posits that one consequence of the lack of trust stemming from concerns over social threat is that individuals will restrain their emotional investment in the relationship (Murray & Holmes, 2009; Murray et al., 2006). For example, when individuals with low self-esteem—who worry that their partners see them negatively—are exposed to social threats (e.g., threats of failure or relationship threat), they show heightened doubts about their partner's positive perceptions of them, withdraw emotionally from their partner (Murray & Holmes, 2009; Murray, Holmes, MacDonald, & Ellsworth, 1998), and also experience reduced overall—not just social—approach motivation (Cavallo, Fitzsimons, & Holmes, 2009). Risk regulation theory suggests that emotional investment will be restrained by perceiving the relationship as less valuable, as marked by indicators like relatively low satisfaction levels. Indeed, research has demonstrated that the low trust of individuals who worry about rejection from their partner lead these individuals to feel less satisfied with their relationships (e.g., Murray et al., 1998; Simpson, 1990). Thus, in the current study, we expected to find that individuals who perceive higher threat in their relationships would report lower relationship satisfaction.

Although social threat may reduce satisfaction with a relationship, it is less clear that threat would also lead to lower commitment. Instead, research suggests that threat may be associated with opposing effects that promote ambivalence around commitment to a romantic partner (MacDonald, Locke, Spielmann, & Joel, in press; Mikulincer, Shaver, Bar-On, & Ein-Dor, 2010). For example, individuals high in anxious attachment have strong fears of rejection from their partner, which have been shown to undermine commitment. However, this process occurs at the same time that anxious attachment promotes a needy dependence on the relationship, which increases commitment (Joel, MacDonald, & Shimotomai, 2011). Overall, these opposing effects cancel each other out, resulting in a non-significant zero-sum relation between anxious attachment and commitment (Joel et al., 2011).

Concerns over social threat may increase investment into a relationship in an effort to promote a partner's dependence on the relationship (Joel, Impett, MacDonald, Gordon, & Keltner, in press; Murray, Aloni, et al., 2009; Murray, Leder, et al., 2009). For example, when individuals feel inferior to their partner, they engage in self-sacrificing behaviors, such as making food for their partner or searching for items their partner cannot find, in an effort to make themselves more indispensable to their partner (Murray, Aloni, et al., 2009). Such investment of one's effort into a relationship promotes higher levels of commitment to the partner (Clark & Grote, 1998; Rusbult, 1983).

Taken together, these findings suggest that individuals concerned with social threat may not be very satisfied with their partner, but they may be relatively highly invested in the relationship. Thus, we expected higher social threat to be associated with both lower satisfaction and higher investment. Since low feelings of satisfaction detract from commitment and higher investment

contributes to commitment, we expected to find an overall null association between threat perceptions and commitment.

Commitment Processes and Reward Perceptions

A separate literature has emerged that emphasizes the importance of social rewards in predicting outcomes in romantic relationships. Although there are many rewards of relationships, intimacy and connection are perhaps the most fundamental and profound rewards of relating to others (e.g., Laurenceau & Kleinman, 2006). Whereas a lack of threat signals that it is *safe* to emotionally invest in a relationship, perceived opportunities for the rewards of intimacy and connection should be what make people *want* to emotionally invest in a relationship. As such, we expected perceived opportunity for social reward to be a powerful motivator of commitment processes. For example, research from a self-expansion perspective shows that perceived opportunities for increasing intimacy and closeness predict greater relationship stability (Aron, Aron, & Smollan, 1992; Tsapelas, Aron, & Orbuch, 2009). Research on the investment model also indicates that rewards in a relationship are associated with higher satisfaction and commitment (Rusbult, 1983). In short, whereas concerns over negative evaluation and rejection may serve to restrain valuing romantic relationships, opportunities for intimacy and connection appear likely to promote valuing and investing in relationships (Gable & Strachman, 2008).

Considering Both Rewards and Threats in Commitment

Overall, then, we suggest that to best understand the factors that influence commitment in romantic relationships, social threat and reward need to be directly accounted for as having independent influences on commitment processes. Although commitment has not been studied in this context, the few studies that have examined the influence of social threat and reward simultaneously on relationship outcomes provide support for the notion that reward is a significant motivator in relationships over and above threat (Lewandowski & Ackerman, 2006; Spielmann et al., 2012; Spielmann, Maxwell, MacDonald, & Baratta, 2013). For example, Lewandowski and Ackerman (2006) showed that a perceived lack of opportunities for self-expansion was a risk factor for infidelity over and above feelings of security. Also, research on approach and avoidance social motivation shows that social approach motivation (related to a desire to pursue social rewards and to the absence of social threats) is linked to positive relationship outcomes, such as higher relationship satisfaction and commitment, whereas social avoidance motivation (related to a desire to avoid social threats and to the absence of rewards) is linked to negative relationship outcomes, such as declining satisfaction and commitment over time (e.g., Frank & Brandstatter, 2002; Gable, 2006; Impett et al., 2010; Strachman & Gable, 2006).¹ These findings suggest that high rewards and low threats may both be important in commitment processes.

Further, research on people's feelings of attachment to an ex-romantic partner that has assessed social threat (i.e., rejection and negative evaluation) and social reward (i.e., intimacy and connection) directly suggests that the potential for social rewards with an ex-partner (particularly when coupled with lack of reward from a

current partner) predicts lingering attachment to an ex more strongly than concerns over threat from either a current or an ex-partner (Spielmann et al., 2012). This pattern of results suggests that obtaining social reward is important for satisfying needs for belonging, and when reward cannot be found in one relationship, individuals will search other relationships for that reward (Spielmann, Joel, MacDonald, & Kogan, 2013; Spielmann et al., 2012). Thus, perceptions of rewards as well as threats appear to fuel behaviors that have important consequences for romantic relationships.

Overall, then, commitment is crucial to relationship stability, and separate theories regarding the regulation of emotional investment centered on social threat and social reward have been forwarded as frameworks for understanding commitment processes. However, no research to date has directly examined the independent influences of the perceptions of social threats and social rewards on commitment. The current research aims to provide data that can integrate these theoretical perspectives by examining which aspects of commitment are influenced by social threats and rewards as well as informing us about the relative strengths of any effects on commitment processes. We predicted that perceptions of strong opportunities for reward in one's romantic relationship would be positively associated with all variables related to stronger commitment. On the other hand, we expected a null relation between social threat and commitment because we expected social threat to be associated with processes that both facilitate and impede commitment (i.e., lower satisfaction and higher investment).

Attachment Styles and Perceptions of Reward and Threat

In our view, a more complete theoretical integration of our reward/threat perspective with existing literature on relationships comes from the recognition that perceptions of social threat and reward in relationships are reliably influenced by individual differences in attachment security. Attachment theory provides one of the most comprehensive organizing frameworks for understanding behavior in close relationships (Bowlby, 1973; Mikulincer & Shaver, 2007). The theory suggests that the attachment system is activated in response to emotional distress, and motivates the pursuit of interpersonal proximity as a means of quelling that distress (e.g., Bowlby, 1973). Research has identified two stable dimensions along which individuals vary in their attachment-related security: *anxiety* and *avoidance* (Mikulincer & Shaver, 2007). These two dimensions are associated with characteristic ways of coping with distress and relating to others that ultimately

¹ Although the approach/avoidance perspective seems to map onto our reward/threat perspective, there are important differences between the two perspectives. It may be assumed that approach motivation is only linked to pursuing perceived rewards, whereas avoidance motivation is only associated with avoiding threats. However, both approach and avoidance motivation are related to both threats and rewards. More specifically, reinforcement sensitivity theory (Gray & McNaughton, 2000) predicts that approach motivations arise both from experiencing reward and from the absence of an expected threat, whereas avoidance motivations arise not just from the presence of threats but also from the absence of expected rewards. Furthermore, our perspective focuses on *perceptions* of rewards and threats, which may not be related to *motivation*. For example, one may perceive opportunities for reward but lack motivation to pursue those rewards.

influence the quality of a relationship and processes related to relationship commitment.

Individuals who are relatively high on the dimension of *attachment anxiety* experience chronic activation of the attachment system, thus motivating chronic pursuit of reassurance (Mikulincer & Shaver, 2007). They have been shown to appraise ambiguous information as threatening and tend to exaggerate the meaning and importance of potentially threatening behaviors from their partner (Alexander, Feeney, Hohaus, & Noller, 2001; Cassidy & Kobak, 1988; Spielmann, Maxwell, et al., 2013). They are also quick to detect any sign of potential social threat (Ein-Dor, Mikulincer, & Shaver, 2011). As a result, anxiously attached individuals experience relatively frequent emotional distress (Alexander et al., 2001; Mikulincer & Shaver, 2007) and are preoccupied with their partner's trustworthiness (Simpson, 1990, 2007). At the same time, anxiously attached individuals are highly dependent on their relationships and try to relieve their distress by seeking comfort from a romantic partner (Feeney & Noller, 1990). We expected that given their strong concerns over negative evaluation and rejection, individuals high in attachment anxiety would also report stronger perceptions of social threat (Spielmann, Maxwell, et al., 2013).

Individuals who are relatively high on the dimension of *attachment avoidance* seek independence and self-reliance, and can be characterized as inhibiting proximity seeking through chronic deactivation of the attachment system (Mikulincer & Shaver, 2007). Highly avoidant individuals maintain attachment system deactivation by blunting the experience of emotions that might otherwise lead them to seek out and depend on others (Cassidy, 1994; Edelstein & Gillath, 2008; Fraley & Davis, 1997). Thus, they distance themselves from their partner and limit closeness and intimacy in order to avoid feelings of threat or dependence on their partner (Cassidy & Kobak, 1988; Mikulincer & Shaver, 2007). For example, the more distressed avoidantly attached individuals feel, the more they withdraw from their partner (Overall, Simpson, & Struthers, 2013; Simpson, Rholes, & Nelligan, 1992).

In addition to distancing to protect themselves from distress, individuals high in attachment avoidance also appear to blunt their experiences of positive emotions. For example, individuals high in attachment avoidance perceive positive social stimuli as less pleasant (Vrtička, Sander, & Vuilleumier, 2012), find everyday interactions with others relatively boring (Tidwell, Reis, & Shaver, 1996), and experience less intense positive emotions in response to positive social stimuli (Rognoni, Galati, Costa, & Crini, 2008) than individuals low in attachment avoidance. Overall, these findings suggest that individuals who are higher in attachment avoidance are likely to see their romantic relationships as less rewarding than individuals who are lower in attachment avoidance. Indeed, research shows that individuals high in attachment avoidance report low levels of intimacy and connection in romantic relationships (Fraley & Davis, 1997; Pistole, Clark, & Tubbs, 1995; Spielmann, Maxwell, et al., 2013), are less committed to romantic partners (Etcheverry, Le, Wu, & Wei, 2012; Kirkpatrick & Davis, 1994; Simpson, 1990), and are primarily focused on their own well-being (Ein-Dor et al., 2011). Thus, we expected that attachment avoidance would be negatively related to perceptions of social reward.

The Current Studies

The current studies aimed to test how the dimensions of attachment anxiety and attachment avoidance relate to relationship commitment through perceptions of social threats and rewards. We expected attachment anxiety to be related to higher perceptions of threat, and attachment avoidance to be related to lower perceptions of reward. In turn, we expected social rewards and threats to exert differing effects on relationship commitment. More specifically, while we expected that perceptions of higher rewards would facilitate relationship commitment, we expected that higher threat perceptions would be associated with processes that both facilitate commitment (i.e., greater investment) and impede commitment (i.e., lower satisfaction). As a result of these opposing effects, we did not expect to find an overall relation between threat and commitment. We further predicted that the negative relation between attachment avoidance and commitment (e.g., Etcheverry et al., 2012; Simpson, 1990) would be mediated by perceptions of low opportunity for social reward, and that attachment anxiety would be unrelated to commitment due to conflicting effects of social threat on commitment processes (e.g., Joel et al., 2011).

We tested these predictions in three studies, using samples of community members who were currently in a romantic relationship. Two of the studies were correlational and the third was experimental, in which we manipulated perceptions of threat and reward in a hypothetical relationship. We used structural equation modeling to analyze our data in all three studies. Structural equation modeling allowed us to test the relations between all of the variables simultaneously, providing estimates of effects while controlling for all of the other effects included in the models.

Study 1

The goal of Study 1 was to provide a preliminary test of our hypotheses using a community sample of adults, all of whom were currently involved in romantic relationships.

Method

Participants. Participants ($N = 537$; 286 females and 86 males, 165 unknown gender) were recruited for this study through online advertisements (e.g., Craigslist). All participants were currently involved in a romantic relationship and completed the questionnaires online in exchange for entry into a draw for a \$50 gift card. Mean relationship length was 16.28 months ($SD = 39.63$, range = 1 month to 532 months) and average age was 26.05 years ($SD = 8.45$, range = 17–62). The majority of participants were dating their partner (55.8%), 15.0% were engaged or common-law/married, and 30.2% did not report their relationship status.

Measures. We describe each of the measures used in the study next. Given that we did not retain all of the items from each questionnaire in our final analysis in order to reduce model complexity, we report two reliability alphas for each scale: the reliability of the full scale in the sample using all items, and the reliability of the scale in the sample using only the items that were retained in our final analysis. Attachment style was measured using a shortened version of the Attachment Style Questionnaire (Feeney, Noller, & Hanrahan, 1994). Attachment avoidance was

measured with 16 items (e.g., “I worry about people getting too close”; full scale $\alpha = .83$, items retained in final analysis $\alpha = .72$), and attachment anxiety was measured with 13 items (e.g., “I worry that I won’t measure up to other people”; full scale $\alpha = .92$, items retained in final analysis $\alpha = .82$). Participants rated each item on a 6-point scale ranging from 1 (*totally disagree*) to 6 (*totally agree*).

The Social Threat and Reward Scale (Spielmann et al., 2012) was used to measure participants’ perceptions of threat and reward in their romantic relationship. The scale includes nine items that measure perceptions of reward (e.g., “My partner and I have a meaningful connection”; full scale $\alpha = .89$, items retained in final analysis $\alpha = .88$). The scale also includes six items that measure perceptions of threat (e.g., “I’m often concerned about my partner judging me negatively”; full scale $\alpha = .82$, items retained in final analysis $\alpha = .82$). Each item is rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Relationship investment was measured using the Investment Model Scale (Rusbult et al., 1998). The scale uses five items to measure relationship satisfaction (e.g., “My relationship is close to ideal”; full scale $\alpha = .95$, items retained in final analysis $\alpha = .95$), relationship investment (e.g., “I feel very involved in our relationship, like I put a great deal into it”; full scale $\alpha = .86$, items retained in final analysis $\alpha = .87$), and quality of alternatives to the relationship (e.g., “My alternatives to our relationship are close to ideal”; full scale $\alpha = .86$, items retained in final analysis $\alpha = .83$), and seven items to measure relationship commitment (e.g., “I am committed to maintaining my relationship with my partner”; full scale $\alpha = .90$, items retained in final analysis $\alpha = .95$). Each item was measured on a 9-point scale ranging from 1 (*don’t agree at all*) to 9 (*agree completely*).

Data analysis. We used structural equation modeling to analyze the data with the software MPlus (Muthén & Muthén, 2007). This analysis method has several advantages over traditional data analysis methods. First, structural equation modeling allows us to test the relations between all of the variables included in the model simultaneously (rather than conducting separate regressions to test each of the paths that would be included in the model separately). Thus, all of the effects are estimated while controlling for all of the other effects in the model (Kline, 2005). Second, the use of latent variables allows us to correct for reliability in the constructs (Kline, 2005). This is because a latent variable represents only the shared variance (i.e., the reliable variance) of the items representing the construct, thereby using only the reliable variance in the predictors and outcome variables. Thus, when a latent variable is used as a predictor (or outcome), only the shared, reliable variance is used to predict an outcome (or is being predicted). This is a very important advantage because it eliminates the influence of random measurement error from the model estimates completely, which other methods of analyses cannot do (i.e., when using aggregate scores both the valid and the error variance is represented in predictors and outcomes and in estimates of effects). Thus, this method provides a stronger test of our hypotheses than more traditional methods.

We first tested our measurement models by conducting confirmatory factor analysis (CFA) on each of the scales included in the final structural model using all of the items from each scale. However, in the final model that tested the structural relations between the variables, we only retained four items as indicators for

each of our constructs, with the exception of the reward and threat scales, for which we retained five items each (we included more items for the reward and threat scales because these scales are relatively new). We allowed residual correlations between indicators within the same constructs where necessary, as these are to be expected in measures that assess psychological constructs (McGrath, 2009). The items retained for each construct were those that had the highest loadings on the latent factor identifying the construct in the CFA. This reduction in the items used for analysis was necessary due to the complexity of the full model tested, which would not have been feasible to test with the inclusion of all of the items from each of the included scales.

In the structural model, paths were tested between the constructs, and only those paths that were significant were retained. We also tested the mediated paths between the attachment constructs and the investment model constructs using the *model indirect* command in MPlus, which tests the significance of the indirect paths (mediation) and the total effects (sum of direct and all indirect paths). To assess the fit of the final model, we relied on the χ^2 values (a non-significant χ^2 value indicates reasonable fit, although with increasing sample sizes, the χ^2 value remains significant even with acceptable model fit), the comparative fit index (CFI; values greater than .90 indicate reasonable fit), the root-mean-square error of approximation (RMSEA; values less than .08 indicate reasonable fit), and the standardized root-mean-square residual (SRMR; values less than .10 indicate reasonable fit) (Kline, 2005).

Results

Figure 1 presents the final model for our analyses (zero-order correlations between all variables are available in the online supplemental materials in Table A). The fit of the model was good, $\chi^2(508) = 928.88$, $p < .01$, CFI = .954, RMSEA = .039, SRMR = .062. We present the fully standardized estimates of the paths in the final model, along with their standard errors of estimate and p values. First, we examined the associations between reward perceptions, the three investment model constructs, and commitment. As predicted by our theoretical model, we found that perceptions of reward predicted higher relationship satisfaction (.76, $SE = .03$, $p < .001$), higher investment in the relationship (.60, $SE = .04$, $p < .001$), and lower quality of alternatives to one’s relationship ($-.33$, $SE = .05$, $p < .001$). We next tested the significance of the mediated effect of reward on commitment, through the three investment model constructs. The total indirect (mediated) effect of reward on commitment was indeed positive and significant (.33, $SE = .05$, $p < .001$). In addition to the effects on investment model constructs, reward perceptions were also directly associated with higher commitment (.54, $SE = .06$, $p < .001$). The total effect of reward on commitment (i.e., the sum of the direct effect and the mediated indirect effects) was thus also significant and positive (.87, $SE = .02$, $p < .001$).

In the next part of the model, we focused on the associations between threat and the investment model constructs. As expected, perceptions of threat predicted lower relationship satisfaction ($-.23$, $SE = .04$, $p < .001$) but also higher investment in the relationship (.20, $SE = .05$, $p < .001$). The indirect effects of threat on commitment through satisfaction ($-.04$, $SE = .02$, $p = .005$) and through investment (.04, $SE = .01$, $p = .002$) were both

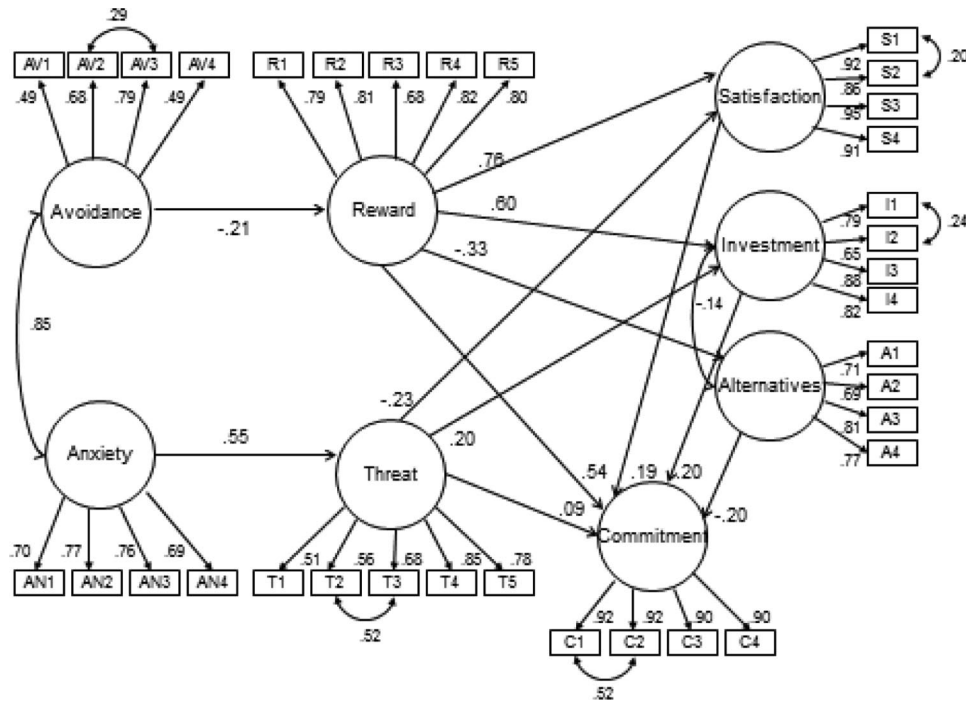


Figure 1. Final model in Study 1 showing the relations between attachment styles, perceptions of reward and threat, and relationship investment. Fully standardized model parameters. S = satisfaction item; I = investment item; A = alternatives item; C = commitment item; R = reward item; T = threat item; AV = avoidance item; AN = anxiety item.

significant but in opposite directions, thus, canceling each other out resulting in a near zero total indirect (i.e., mediated) effect of threat on commitment ($-.004$, $SE = .02$, $p = .825$). However, threat perceptions were also directly associated with commitment ($.09$, $SE = .04$, $p = .012$), such that higher threat was associated with higher relationship commitment. Thus, the overall effect of threat on commitment, including the mediated and the direct effect, was also positive ($.08$, $SE = .03$, $p = .016$).

We next examined the associations of attachment avoidance and anxiety with threat and reward perceptions. As predicted, we found that attachment avoidance predicted lower perceptions of reward ($-.21$, $SE = .06$, $p < .001$), whereas attachment anxiety predicted higher perceptions of threat ($.55$, $SE = .05$, $p < .001$). Attachment anxiety and avoidance were correlated ($.85$, $SE = .03$, $p < .001$).² We then examined whether social threat and social reward mediate the association between attachment insecurity and relationship commitment. As expected, we found that attachment avoidance had a significant negative total indirect effect on commitment, mediated by lower reward perceptions ($-.18$, $SE = .05$, $p < .001$). In the case of attachment anxiety, although the mediated effect of anxiety on commitment through threat and satisfaction was significant and negative ($-.02$, $SE = .01$, $p = .007$), this was canceled out by the significant positive associations between anxiety and commitment through threat and investment ($.02$, $SE = .01$, $p = .003$), and through threat directly ($.05$, $SE = .02$, $p = .016$). Thus, the total indirect effect of attachment anxiety on commitment was positive ($.05$, $SE = .02$, $p = .019$).

In the final part of the model, we tested whether the three investment model constructs each contribute to commitment inde-

pendently, as predicted by the investment model (Rusbult, 1980; Rusbult et al., 1998). Consistent with the investment model, we found that higher satisfaction ($.19$, $SE = .06$, $p = .001$), higher investment in the relationship ($.20$, $SE = .04$, $p < .001$), and lower quality of alternatives ($-.20$, $SE = .03$, $p < .001$) were associated with higher levels of commitment to the relationship. We also found an additional residual relation between investment and alternatives, such that higher quality of alternatives were associated with lower investment in the relationship ($-.14$, $SE = .06$, $p = .031$).

Reward and satisfaction. Given the particularly strong relation between satisfaction and perceptions of reward ($.76$, $SE = .03$), we wanted to ensure that the two variables are measuring separate constructs and are not redundant with one another. Thus, we conducted CFA with the satisfaction and the reward items to test two possible models: a one-factor solution (where the reward and satisfaction items load on a single latent factor and are therefore measuring the same construct) and a two-factor solution (the reward and the satisfaction items load on separate factors that are correlated with one another). Results of this analysis indicated that

² Given the strong association between attachment anxiety and avoidance, we compared a one-factor solution to a two-factor solution for the attachment scales. A chi-square difference test indicated that a two-factor solution where anxiety and avoidance are separate dimensions provides better fit to the data, $\delta \chi^2(\delta df = 2) = 46.74$, $p < .001$. Furthermore, using an observed score for anxiety and avoidance based on an average score of all items in the measure resulted in no changes in our findings, but the covariation between anxiety and avoidance dropped from $.85$ to $.51$.

the two-factor solution fit the data well, $\chi^2(26) = 78.87, p < .001$, CFI = .982, RMSEA = .071, SRMR = .032, whereas the one-factor solution indicated inadequate fit to the data, $\chi^2(27) = 385.99, p < .001$, CFI = .879, RMSEA = .181, SRMR = .086. A χ^2 difference test comparing the two models indicated that the one-factor model provided a significantly worse fit to the data than the two-factor model, $\delta \chi^2(\delta df = 1) = 307.12, p < .001$. Thus, our data suggest that perceptions of reward and satisfaction are different constructs and are not redundant with one another.

Testing alternative models. As mentioned above, we tested multiple models³ and only retained the paths in the final model that were significant. In addition to the final model, we also tested a model where perceptions of reward and threat were regressed on both attachment avoidance and anxiety. However, in this model, neither the path between reward and attachment anxiety (.15, $SE = .19, p = .406$) nor the path between threat and attachment avoidance (.18, $SE = .17, p = .295$) was significant. These paths were thus dropped from the final model. We also tested whether there was a correlation between perceptions of reward and threat, however, this relation was not significant ($-.09, SE = .07, p = .187$) and was also removed from the final model. We further tested a model in which we included a path between threat perceptions and alternatives; however, this path was not significant (.05, $SE = .06, p = .392$) and was thus removed.

Discussion

As predicted by our theoretical model, higher attachment avoidance uniquely predicted lower perceptions of reward in one's relationship, which were in turn associated with higher quality of alternatives, less investment, and lower relationship satisfaction and commitment. Perceptions of reward significantly mediated the effect of attachment avoidance on commitment. In other words, avoidantly attached individuals exhibited lower dedication to their relationships because they felt that their relationships provided fewer rewards compared to those who were lower in attachment avoidance. The effects for attachment anxiety and perceptions of threat were more complex. As expected, higher attachment anxiety uniquely predicted higher perceptions of threat in one's relationship. In turn, higher perceptions of threat were associated with less satisfaction, greater investment, and, unexpectedly, higher commitment. Indeed, anxious attachment was positively associated with commitment, an effect that was mediated by perceptions of threat.

Study 2

Despite the fact that the results of Study 1 largely supported our hypotheses, the finding of a positive association between threat perceptions and higher commitment was unexpected. Given that we did not anticipate this association, we sought evidence of replication before drawing strong conclusions. Thus, we conducted Study 2, which was an exact replication of Study 1 (Simmons, Nelson, & Simonsohn, 2011), in order to seek confirmation of our initial findings in Study 1 with a larger sample.

Method

Participants. Participants ($N = 1,110$) were recruited for this study through Amazon's Mechanical Turk. All participants were

required to be currently involved in a romantic relationship. In this study, we report data from a total of 866 participants (487 females, 367 males, 12 did not specify their gender) who met the participation requirements (i.e., indicated that they were currently involved in a relationship) and had missing data on less than five items used in the analysis. Mean relationship length was 21.55 months ($SD = 28.62$, range = 1 month to 288 months) and average age was 27.34 years ($SD = 8.48$, range = 18–66). The majority of the participants were dating their partner (77.7%), and the remaining were engaged or common-law/married (22.3%).

Measures. In this study, we used the same procedures as in Study 1; thus, we again report reliability alphas for each of the scales with all items included and with only those items that were included in the final analysis. Attachment style was measured using the same shortened version of the Attachment Style Questionnaire (Feeney et al., 1994) as used in Study 1 (attachment avoidance: full scale $\alpha = .83$, items retained in final analysis $\alpha = .72$; attachment anxiety: full scale $\alpha = .87$, items retained in final analysis $\alpha = .81$). As in Study 1, we used the Social Threat and Reward Scale (Spielmann et al., 2012) to assess perceptions of reward (full scale $\alpha = .91$, items retained in final analysis $\alpha = .90$) and threat (full scale $\alpha = .81$, items retained in final analysis $\alpha = .81$) in participants' current romantic relationship. The Investment Model Scale (Rusbult et al., 1998) was used again to measure relationship satisfaction (full scale $\alpha = .95$, items retained in final analysis $\alpha = .93$), investment (full scale $\alpha = .86$, items retained in final analysis $\alpha = .89$), quality of alternatives (full scale $\alpha = .89$, items retained in final analysis $\alpha = .87$), and commitment (full scale $\alpha = .89$, items retained in final analysis $\alpha = .94$).

Data analysis. In order to conduct our analyses, we once again used structural equation modeling with the software MPlus (Muthén & Muthén, 2007). Given that our intention was to replicate the results of Study 1, we used the exact same items as in Study 1 to identify our latent constructs. As with Study 1, we present the final model that includes only the significant paths, followed by a description of the alternative models that we tested. We relied on the same fit indices as in Study 1.

Results

Figure 2 presents the final model for our analyses (zero-order correlations between all variables are available in the online supplemental materials in Table B). The fit of the model was good, $\chi^2(508) = 1,418.56, p < .01$, CFI = .954, RMSEA = .045, SRMR = .057. We present the fully standardized estimates of the paths in the final model, along with their standard errors of

³ Although it is not possible to obtain standardized path estimates for effects of interactions between latent variables on other constructs, we ran multiple additional analyses in all three studies to test interactions between reward and threat perceptions (predicting investment model constructs), and between anxiety and avoidance (predicting reward and threat perceptions), as well as possible moderation by age and relationship length. Moderation by gender and relationship status were also tested using multiple-group analysis. In Studies 1 and 3, none of these analyses yielded significant effects. In Study 2, we did find some significant interactive effects; however, given the inconsistency of these effects across the three studies and the large number of total tests conducted, we do not report and interpret these effects. (We conducted a total of 146 significance tests in these analyses with nine significant results: a rate of 6%, which is consistent with the number of significant effects expected by chance at $p = .05$.)

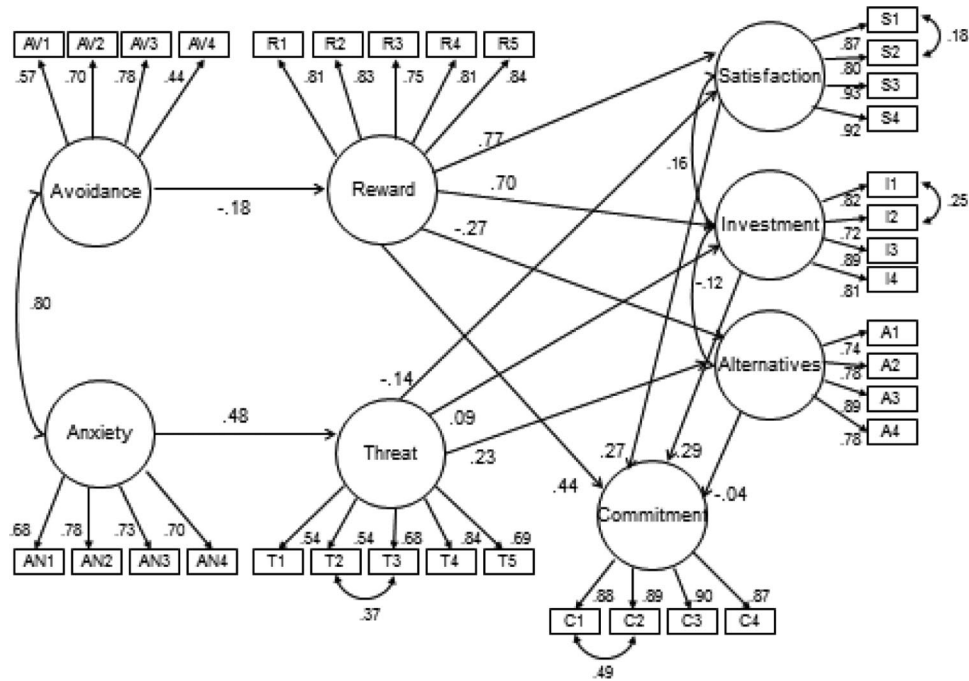


Figure 2. Final model in Study 2 showing the relations between attachment styles, perceptions of reward and threat, and relationship investment. Fully standardized model parameters. S = satisfaction item; I = investment item; A = alternatives item; C = commitment item; R = reward item; T = threat item; AV = avoidance item; AN = anxiety item.

estimate. First, we sought to replicate our results in Study 1 regarding the association between reward and the three investment model constructs. In line with Study 1, we once again found that higher reward perceptions predicted higher satisfaction (.77, $SE = .02$, $p < .001$), higher investment in the relationship (.70, $SE = .02$, $p < .001$), and lower quality of alternatives (-.27, $SE = .04$, $p < .001$). The mediated association between reward and relationship commitment, through the three investment model constructs, was significant and positive (.43, $SE = .03$, $p < .001$). Higher reward also directly predicted higher commitment (.44, $SE = .04$, $p < .001$); thus, the total effect of reward on commitment that included both the direct and indirect effects was positive and statistically significant (.87, $SE = .01$, $p < .001$).

Next, we tested the association between threat and the three investment model constructs. As in Study 1, we found that higher threat perceptions predicted lower relationship satisfaction (-.14, $SE = .03$, $p < .001$) and higher investment in the relationship (.09, $SE = .03$, $p = .003$). In this study, we also found that higher threat was associated with higher quality of alternatives to one's relationship (.23, $SE = .04$, $p < .001$). Similar to our findings in Study 1, the total indirect effect of threat on relationship commitment was not significant (-.02, $SE = .02$, $p = .184$) because the negative effects of threat on commitment through satisfaction (-.04, $SE = .01$, $p < .001$) and alternatives (-.01, $SE = .01$, $p = .087$), and its positive effects through investment (.03, $SE = .01$, $p = .005$) canceled one another out. (Given a lack of direct effect of threat on commitment in this study, the total effect of threat on commitment was identical to the indirect effect.)

We next examined the associations of attachment avoidance and anxiety with perceptions of reward and threat. Consistent with the

findings of Study 1, higher levels of attachment avoidance predicted lower reward perceptions (-.18, $SE = .04$, $p < .001$), whereas higher levels of attachment anxiety predicted higher threat perceptions (.48, $SE = .03$, $p < .001$). Attachment anxiety and avoidance were again correlated (.80, $SE = .02$, $p < .001$).⁴ We also examined whether perceptions of threat and reward mediated the association between the attachment dimensions of avoidance and anxiety and relationship commitment. Indeed, attachment avoidance was associated with lower commitment, which was mediated by lower perceptions of reward (-.16, $SE = .03$, $p < .001$). However, attachment anxiety was not significantly associated with commitment (-.01, $SE = .01$, $p = .186$), due to the positive effect of threat on commitment through investment (.01, $SE = .01$, $p = .007$) and the negative effects through alternatives (-.004, $SE = .002$, $p = .090$) and satisfaction (-.02, $SE = .004$, $p < .001$). Thus, this positive association and the negative associations canceled one another out, resulting in the overall null effect.

Finally, we tested the contributions of the investment model constructs to relationship commitment. As predicted by the invest-

⁴ Given the strong association between attachment anxiety and avoidance, we again compared a one-factor solution to a two-factor solution for the attachment scales. A chi-square difference test indicated that a two-factor solution where anxiety and avoidance are separate dimensions provides better fit to the data, $\delta \chi^2(\delta df = 2) = 142.32$, $p < .001$. Furthermore, using an observed score for anxiety and avoidance based on an average score of all items in the measure resulted in no changes in our findings, but the covariation between anxiety and avoidance dropped from .80 to .47.

ment model (Rusbult, 1980; Rusbult et al., 1998), higher relationship satisfaction (.27, $SE = .03$, $p < .001$), higher investment in the relationship (.29, $SE = .03$, $p < .001$), and lower quality of alternatives ($-.04$, $SE = .02$, $p = .074$) were associated with higher levels of relationship commitment. We also found that higher investment was directly associated with both lower quality of alternatives ($-.12$, $SE = .04$, $p = .003$) and higher relationship satisfaction (.16, $SE = .04$, $p < .001$).

Reward and satisfaction. In this data set, the relation between reward and satisfaction was once again quite strong (.77, $SE = .02$). Thus, we conducted CFA again to examine whether a one-factor model (where the reward and satisfaction items measure the same construct) or a two-factor model (where the reward and satisfaction items measure different constructs) provides better fit to the data structure. Results of this analysis indicated that the two-factor solution fit the data well, $\chi^2(24) = 101.48$, $p < .001$, CFI = .988, RMSEA = .061, SRMR = .022, whereas the one-factor solution indicated inadequate fit to the data, $\chi^2(25) = 722.57$, $p < .001$, CFI = .889, RMSEA = .180, SRMR = .071. A χ^2 difference test comparing the two models indicated that the one-factor model provided a significantly worse fit to the data than the two-factor model, $\delta \chi^2(\delta df = 1) = 621.09$, $p < .001$. Thus, perceptions of reward and satisfaction measure different constructs and are not redundant with one another.

Testing alternative models. As mentioned above, we tested multiple models (see Footnote 3) and only retained the paths in the final model that were significant. We tested whether attachment anxiety was associated with perceptions of reward, but this path was not statistically significant ($-.02$, $SE = .09$, $p = .781$). The path between attachment avoidance and threat perceptions was also not statistically significant (.04, $SE = .09$, $p = .674$). We also tested whether threat perceptions were correlated with reward perceptions, but this correlation was not significant ($-.07$, $SE = .04$, $p = .109$). In this study, we also found that the path between threat perceptions and relationship commitment was not statistically significant (.03, $SE = .02$, $p = .156$) and was thus removed.

Discussion

The results of Study 2 replicated most of the findings from Study 1. Specifically, higher attachment avoidance uniquely predicted lower reward perceptions, which, in turn, predicted lower satisfaction, less investment, and higher quality of alternatives. Lower reward perceptions were also associated with lower relationship commitment. Furthermore, reward perceptions significantly mediated the effect of attachment avoidance on commitment. Replicating Study 1, higher attachment anxiety uniquely predicted higher threat perceptions. Also replicating Study 1, higher perceptions of threat were related to less satisfaction and more investment in the relationship. However, unlike Study 1, threat was not directly associated with relationship commitment and was associated with higher quality of alternatives. Overall, as originally hypothesized, social threat perceptions were associated with effects on commitment that canceled one another out, resulting in no overall association of threat with commitment.

Meta-Analysis

Although the results for the links for reward with the investment model constructs, and the links for threat with satisfaction and invest-

ment were consistent across the two studies, the associations of commitment and alternatives with threat did not replicate, with threat predicting commitment directly in Study 1 but not in Study 2, as well as threat predicting quality of alternatives in Study 2 but not in Study 1. Thus, we conducted a mini meta-analysis, using data from the two studies, in order to help arrive at an overall conclusion regarding the associations between reward, threat, and investment model constructs (i.e., satisfaction, alternatives, investment, commitment). By conducting a meta-analysis, we were able to synthesize our data and estimate the size of these effects with much greater precision and obtain 95% confidence intervals for each estimated effect.

Method and Results

Using the standardized estimates of the associations between the constructs of interest from the models of each study ($N = 1,399$), we conducted meta-analyses using the software CMA2 (Borenstein & Rothstein, 2001). We derived estimates with 95% confidence intervals for each of the paths between both reward and threat and the four investment model constructs (see Table 1). When the confidence intervals do not include zero as a value, the estimate is significantly different from zero at $p < .05$. When the confidence intervals of two estimates do not overlap, they are significantly different from each other at $p < .05$. Furthermore, we derived estimates and confidence intervals of the indirect effects of threat and reward on commitment (mediated through satisfaction, investment, and alternatives), the total effects on commitment that included both direct and indirect effects, and the indirect effects of attachment anxiety and avoidance on commitment (mediated through perceptions of threat and reward, respectively).

As expected based on the results of the two individual studies, the associations between reward and all four of the investment model constructs were statistically significant. Higher rewards in a relationship were associated with higher relationship satisfaction (.77, 95% CI [.74, .80]), higher investment (.67, 95% CI [.63, .71]), and lower quality of alternatives ($-.29$, 95% CI [$-.34$,

Table 1
Estimates of Fixed Effects Based on Meta-Analysis With 95% Confidence Intervals

Effect	Estimate	Confidence interval	
		Lower limit	Upper limit
Reward			
Satisfaction	.77	.74	.80
Investment	.67	.63	.71
Alternatives	-.29	-.34	-.23
Commitment—Direct	.46	.40	.53
Commitment—Indirect	.40	.34	.45
Commitment—Total	.87	.85	.89
Threat			
Satisfaction	-.17	-.21	-.12
Investment	.12	.07	.17
Alternatives	.18	.11	.24
Commitment—Direct	.05	.01	.08
Commitment—Indirect	-.02	-.05	.003
Commitment—Total	.03	-.01	.07
Attachment			
Anxiety—Commitment	.02	-.01	.04
Avoidance—Commitment	-.17	-.22	-.11

-.23]). The indirect, mediated effect of rewards on commitment, through the three investment model constructs, was also statistically significant and positive (.40, 95% CI [.34, .45]). Higher reward was also directly associated with higher commitment (.46, 95% CI [.40, .53]). Thus, the total effect of reward on commitment, including both the mediated and the direct effects, was positive and statistically significant (.87, 95% CI [.85, .89]).

The associations between threat and the four investment model constructs were also statistically significant, although the effects were considerably smaller than the effects for rewards. Higher threat was associated with lower satisfaction (-.17, 95% CI [-.21, -.12]) and higher quality of alternatives (.18, 95% CI [.11, .24]) but also with higher investment (.12, 95% CI [.07, .17]). The indirect, mediated effect of threat on commitment through the three investment model constructs was not statistically significant (-.02, 95% CI [-.05, .003]), once again showing that these opposing effects of threat on commitment cancel each other out. Threat was also directly associated with higher commitment (.05, 95% CI [.01, .08]). However, the total effect of threat on commitment, including the mediated and the direct effect, was near zero and was not statistically significant (.03, 95% CI [-.01, .07]).

Finally, we also derived estimates of the indirect effects of attachment styles on commitment, mediated through perceptions of reward and threat. The indirect effect of attachment avoidance on commitment (mediated through reward) was negative (-.17, 95% CI [-.22, -.11]), indicating that higher attachment avoidance is associated with lower commitment. In contrast, the indirect effect of attachment anxiety on commitment (mediated through threat) was not significant (.015, 95% CI [-.005, .035]), due to opposing effects of threat on commitment that cancel each other out.

Discussion

The results of the meta-analysis indicated that both reward and threat are associated with relationship satisfaction, investment in a relationship, and perceptions of the quality of one's alternatives to a relationship. However, although the total effects of reward on commitment were positive (considering both direct and indirect effects), the total effects of threat on commitment were not significantly different from zero, due to the opposing effects of threat on commitment. Importantly, because our analytic technique tested associations controlling for all other associations, we can be confident that the effects of social reward and threat are independent of one another. As evidenced by the non-overlapping confidence intervals of the total effects of threat and reward on commitment, the influence of perceived opportunity for reward in one's relationship is a significantly stronger predictor of commitment to a relationship than perceived threat of negative evaluation by one's relationship partner. Our results also indicated that attachment avoidance is associated with lower commitment, whereas attachment anxiety is not significantly associated with commitment, as a result of conflicting effects on commitment processes (e.g., Joel et al., 2011).

Study 3

In general, our hypotheses were supported across the two correlational studies. Although these results are encouraging, the correlational nature of the research limits claims we can make

regarding causality. Thus, our goal with the final study was to examine the effects of experimental manipulations of reward and threat perceptions on investment model variables. Study 3 was a 2 (social reward: high vs. low) \times 2 (social threat: high vs. low) experimental design. Participants were asked to imagine themselves in a hypothetical relationship described by a vignette, and they were randomly assigned to receive a vignette that was either high or low in social reward and either high or low in social threat. Participants then completed a questionnaire measuring the investment model constructs as if they were in that hypothetical relationship. Data were analyzed using structural equation modeling.

Method

Participants. Participants were recruited through Amazon's Mechanical Turk. We recruited a sample of individuals ($N = 426$) who were currently involved in a romantic relationship in order to heighten the realism of the imagined relationship scenario. The analyses are based on a subset of participants ($N = 358$; 155 men and 203 women) who remained in the sample after removing duplicates (i.e., people who participated twice) and individuals who failed an attention check embedded in the questionnaire. Average age of the sample was 32.78 years ($SD = 11.78$, range = 18–68). The majority of participants were involved in a non-marital dating relationship (61.2%; the remaining 38.3% were married, and two participants did not indicate the nature of their relationship). The mean relationship length was 76.18 months ($SD = 91.41$, range = 1–510).

Procedures. We created four scenarios in which we manipulated both reward perceptions (high or low) and threat perceptions (high or low). We based our descriptions of reward and threat on the items included in the Social Threat and Reward Scales (Spielmann et al., 2012), with particular emphasis on the items that were used to identify the latent factors of threat and reward in both Study 1 and Study 2. The key passage in the relationship with high reward read,

You really feel that you have developed a meaningful connection with your partner. When you spend time together with your partner, you experience many strong positive feelings, and feel closer to them than you've ever felt to somebody. You realize that you love your partner a lot.

The key passage of the relationship with low reward read,

You do *not* really feel that you have developed a meaningful connection with your partner or that you have many strong positive feelings for them. Although you have some things you like doing together, you do not feel very close to them and you realize that you do not expect to get much out of the relationship.

These descriptions of reward were paired with descriptions of either high or low threat. The scenario with high threat contained the statements,

You really worry about your partner judging you negatively, so you try to make sure that you avoid saying foolish things around them or doing something dumb. Sometimes you feel that your partner does not want to be with you because of your faults.

The low threat scenarios contained the statements,

When you are spending time with your partner you feel that you really do not have to worry about your partner judging you negatively, no

matter what you say or do around them. You feel that your partner has really accepted who you are, despite your faults.

Thus, for example, participants randomly assigned to receive a scenario low in reward and low in threat read the following:

You have been involved in an intimate, romantic relationship with your partner for quite some time now. In thinking about your relationship, you do *not* really feel that you have developed a meaningful connection with your partner or that you have many strong positive feelings for them. Although you have some things you like doing together, you do not feel very close to them and you realize that you do not expect to get much out of the relationship. When you are spending time with your partner, you feel that you really do not have to worry about your partner judging you negatively, no matter what you say or do around them. You feel that your partner has really accepted who you are, despite your faults.

Measures. Participants completed questions about their demographic information and completed the same attachment scales as in Studies 1 and 2 to assess attachment anxiety (full scale $\alpha = .85$, items retained in analysis $\alpha = .81$) and avoidance (full scale $\alpha = .77$, items retained in analysis $\alpha = .76$). After reading the scenario, participants were instructed to rate how they would feel if they were involved in the relationship described. As in Studies 1 and 2, we measured relationship satisfaction (full scale $\alpha = .97$, items retained in analysis $\alpha = .97$), relationship investment (full scale $\alpha = .90$, items retained in analysis $\alpha = .90$), quality of alternatives to the relationship (full scale $\alpha = .89$, items retained in analysis $\alpha = .88$), and commitment (full scale $\alpha = .95$, items retained in analysis $\alpha = .97$) using the Investment Model Scale (Rusbult et al., 1998) on 9-point scales (1 = *don't agree at all*, 9 = *agree completely*). Given that we used the wording of the items from the Social Threat and Reward Scale (Spielmann et al., 2012) to create high and low levels of reward and threat in our scenarios, we did not administer the scale after participants read the scenario to avoid demand effects.

Data analysis. We used a similar analytic strategy for Study 3 as we did for the other two studies, with some differences. We again conducted our analysis using structural equation modeling with the software MPlus (Muthén & Muthén, 2007) and started with conducting CFA for each of the scales. In order to model the investment model variables, we used the same items to identify the latent construct as we did in Studies 1 and 2 in order to ensure the comparability of the three studies. However, given that perceptions of reward and threat were manipulated in this study, we only modeled the investment model variables as latent variables, and included reward and threat perceptions as separate, categorical predictor variables. The same model fit indices were used as in the first two studies to evaluate the fit of our models.

Results

Figure 3 presents the final model from the analysis (zero-order correlations between all variables are available in the online supplemental materials in Table C). The fit of the model was good, $\chi^2(120) = 238.85$, $p < .01$, CFI = .983, RMSEA = .053, SRMR = .037. First, we examined the effects of the reward manipulation on the investment model constructs. Those in the high relationship reward condition reported higher satisfaction

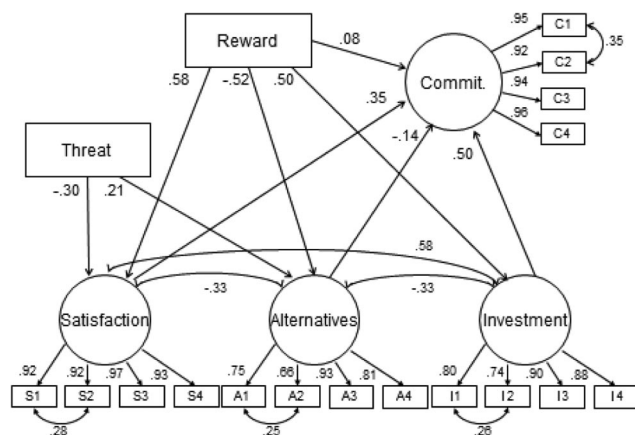


Figure 3. Final model in Study 3 showing the relations between perceptions of reward and threat and relationship investment. Fully standardized model parameters. S = satisfaction item; I = investment item; A = alternatives item; C = commitment item.

(.58, $SE = .04$, $p < .001$) and investment in the relationship (.50, $SE = .04$, $p < .001$), and lower quality of alternatives ($-.52$, $SE = .04$, $p < .001$) than those in the low relationship reward condition. The indirect effect of reward on commitment, mediated through the three investment model constructs, was positive and significant (.53, $SE = .04$, $p < .001$). In addition, compared to those in the low reward condition, those in the high reward condition also directly reported higher commitment (.08, $SE = .03$, $p = .010$); thus, the total effect of reward on commitment, including both mediated and direct effects, was positive and significant (.61, $SE = .03$, $p < .001$).

Next, we examined the effects of the threat manipulation on the investment model constructs. We found that those in the high relationship threat condition reported lower relationship satisfaction ($-.30$, $SE = .04$, $p < .001$) and higher alternatives (.21, $SE = .05$, $p < .001$) than those in the low threat condition. The indirect effect of threat on commitment, mediated through the investment model constructs, was negative and significant ($-.14$, $SE = .02$, $p < .001$). Given that threat was not directly associated with commitment, the indirect effect of threat on commitment was identical to the total effect; thus, compared to those in the low threat condition, those in the high threat condition reported lower commitment due to lower satisfaction and higher quality of alternatives.

Finally, as predicted by the investment model (Rusbult, 1980; Rusbult et al., 1998), higher relationship satisfaction (.35, $SE = .04$, $p < .001$), higher investment in the relationship (.50, $SE = .04$, $p < .001$), and lower quality of alternatives ($-.14$, $SE = .03$, $p < .001$) were associated with higher commitment. The three investment model constructs were also associated with one another. Higher relationship satisfaction was associated with lower quality of alternatives ($-.33$, $SE = .05$, $p < .001$) and higher investment (.58, $SE = .04$, $p < .001$). Higher investment was also associated with lower quality alternatives ($-.33$, $SE = .06$, $p < .001$).

Testing alternative models. We again tested multiple models (see Footnote 3) and only retained the paths in the final model that were significant. In addition to the final model, we tested whether

the paths between threat and investment ($-.06$, $SE = .05$, $p = .220$) and commitment ($.02$, $SE = .03$, $p = .408$) were significant; however, these paths were not significant and were removed from the final model.

We also tested whether the interaction between reward and threat predicted the investment model constructs; however, the interaction term was not a significant predictor of any of the constructs. We also wanted to show that the investment model variables are affected by reward and threat perceptions uniquely, thus, we also ran our analyses controlling for attachment anxiety and avoidance. Given that people were randomly assigned to our conditions (and not based on attachment styles), we did not expect attachment styles to be significant predictors in our models. As expected, attachment style was unrelated to any of the dependent variables in the model (there were no significant main effects, and there were no two- or three-way interactions involving attachment and reward or threat).

Discussion

Study 3 largely replicated the findings from the previous two correlational studies, but the experimental design of Study 3 increases our ability to draw causal conclusions from the data. Consistent with our predictions, participants who were randomly assigned to imagine a relationship with high levels of intimacy and connection reported higher satisfaction, higher investment, and lower quality of alternatives, and thus, higher relationship commitment compared to those who were assigned to the low-reward condition. These data suggest that higher levels of social reward promote higher levels of all facets of commitment. Participants who were randomly assigned to imagine a relationship in which they were concerned about rejection reported lower relationship satisfaction and higher quality of alternatives compared to those who were assigned to the low-threat condition. However, the social threat manipulation did not affect investment or have a direct effect on commitment. The presence of an association between threat and investment only in the correlational, but not the experimental, studies may suggest that the direction of causality in this relation may be that higher investment leads to greater concerns about rejection.

General Discussion

The results of two correlational and one experimental study indicated that attachment anxiety and avoidance were associated with commitment processes through threat- and reward-related mechanisms, respectively. Attachment anxiety was uniquely linked to higher threat perceptions, whereas attachment avoidance was associated with perceptions of less reward in relationships. Perceptions of threats and rewards were, in turn, related to the investment model constructs differently. Whereas perceptions of threat were associated with lower relationship satisfaction, higher quality of alternatives, and higher investment (although not in our experimental study), perceptions of reward were associated with higher relationship satisfaction, higher investment, lower quality of alternatives, and also higher commitment.

Threats, Rewards, and Commitment

The findings with regards to the effects of perceived rewards on commitment were clear and consistent. In line with prior work emphasizing the importance of the positive aspects of relationships (Aron et al., 1992; Gable & Strachman, 2008; Tsapelas et al., 2009), perceptions of social rewards were consistently associated with all of the constructs in the investment model. Those who perceived their relationship as high in intimacy and connection were more satisfied with the relationship, more invested in the relationship, and perceived the alternatives to their relationship as lower in quality. These data suggest that when a relationship is highly rewarding, individuals are happier with the relationship, more willing to place resources into it, and less likely to believe that being single or being with another partner would be a good alternative to their current relationship. Furthermore, reward perceptions were also directly associated with higher relationship commitment. Indeed, the experimental nature of Study 3 suggests that intimacy and connection are important in driving commitment processes. It is important to note that these effects of relationship rewards emerged while controlling for the effects of threat in all of our models, suggesting that the effects of reward are independent of the influence of threats.

The findings for social threat were more nuanced. Consistent with existing work on the effects of rejection concerns on relationship evaluations (Murray & Holmes, 2009, 2011; Murray et al., 1998), we found that social threat was associated with less satisfaction and higher quality alternatives to one's relationship. Given that these effects held in our experimental study, we can more safely conclude that concerns over rejection lead to lower satisfaction and perceptions of higher quality of alternatives. The results provide more evidence that individuals who worry about negative evaluation from their partner are prone to emotional withdrawal marked by an erosion of relationship satisfaction. The results also point toward heightened attraction to alternative relationships as a perhaps less studied consequence of rejection concerns.

In our correlational studies, we also found that higher threat perceptions were related to greater investment in the relationship. These findings are consistent with work showing that individuals who are concerned about their partner's rejection actively try to increase their partner's dependence on them by investing more resources into the relationship (Joel et al., in press; Murray, Aloni, et al., 2009; Murray, Leder, et al., 2009). However, this association between threat and investment did not emerge in our experimental study, which is inconsistent with prior studies wherein feelings of threat were experimentally induced and resulted in investing more in the relationship (Murray, Aloni, et al., 2009; Murray, Leder, et al., 2009). The lack of association between threat and investment in the experimental study may stem from our use of a hypothetical relationship scenario. Rather than drawing out the experience of being concerned about rejection, the hypothetical scenario may have led people to rely on their lay theories about responses to social threat. People may assume that feeling threatened inhibits investment into the relationship, which may be inconsistent with how those who worry about negative evaluation actually respond to heightened rejection concerns. It is possible that such a disconnect between lay theory and reality regarding the effects of rejection concerns on investment partly underlies the surprise that can

be expressed when witnessing others remain in troubled relationships (e.g., Rusbult & Martz, 1995).

It is also possible that we did not find an association between threat and investment in the experimental study because the causal link runs in a direction opposite to our hypothesis. Perhaps as people increase their investments into the relationship over time, they become increasingly concerned about rejection from their partner, as they would lose everything they invested should their partner decide to end the relationship (Murray et al., 2006). The design of our experimental study limits our ability to interpret these findings clearly, but in future work, the causal direction of the link between threat and investment should be investigated. We anticipate that this association may be bidirectional, with causality flowing in both directions.

As we expected, we found some support for the opposing effects of threat on commitment. In the correlational studies, the effects of threat on higher investment and lower satisfaction canceled one another out, resulting in an overall null relation between threat and commitment. This finding is consistent with other work showing that strong rejection concerns promote ambivalence toward romantic relationships (MacDonald et al., in press; Mikulincer et al., 2010) and result in opposing effects on commitment (Joel et al., 2011). However, in our experimental study we found a negative relation between threat and commitment, given that threat was unrelated to investment. These findings suggest the need to examine systems of responses in romantic relationships rather than single dependent variables to uncover the tensions, contradictions, and ambivalence that can be a part of relationship functioning.

Although some readers may be surprised that the effects of social threat on commitment were not stronger than the effects of social rewards, our research suggests that threats and rewards might hold differential sway over different aspects of relationships. Research on the influence of social threat on relationship processes has tended to focus on its effects on trust and satisfaction, rather than on people's feelings of commitment. This work has clearly shown the importance of threat perceptions for the establishment of trust between partners (Murray & Holmes, 2009; Murray et al., 2006; Simpson, 2007).⁵ However, the importance of rewards and threats may shift based on the relationship outcome under consideration, and future work examining the simultaneous influence of both relationship rewards and threats on trust may well show threat to be the more crucial factor in shaping feelings of trust in relationships. It is also possible that threat perceptions play a more defining role early on in relationships as partners are getting to know each other and are not yet able to fully anticipate their partner's reactions to their vulnerabilities (Eastwick & Finkel, 2008; Holmes & Rempel, 1989). The rewards of intimacy and closeness may then become more important once a basic level of trust has been established. Future research that examines the influence of threat and reward perceptions on multiple indicators of relationship functioning as relationships develop and progress over time is needed.

Threats, Rewards, and Attachment

Our studies also showed that the effects of social threat and reward are reliably predicted by individual differences in the attachment dimensions of anxiety and avoidance. As expected, based on prior work showing the hypersensitivity of anxiously

attached individuals to signs of rejection from a partner (Alexander et al., 2001; Cassidy & Kobak, 1988; Ein-Dor et al., 2011; Mikulincer & Shaver, 2007), attachment anxiety was uniquely associated with higher perceptions of social threat. Given that threat perceptions were associated with both processes that facilitate higher commitment (i.e., higher investment) and processes that impede commitment (i.e., lower satisfaction and higher quality of alternatives), the overall net effect of attachment anxiety on relationship commitment was not significant. This null effect is consistent with prior research showing that attachment anxiety is associated with opposing effects on relationship commitment (Joel et al., 2011) and ambivalence toward relationships (MacDonald et al., in press; Mikulincer et al., 2010).

Of note, attachment anxiety was not associated with stronger perceptions of reward in relationships. Given the strong value placed on relationships by those high in attachment anxiety, the lack of association between anxiety and reward may seem surprising. However, this null effect is consistent with prior work on attachment anxiety and reward (Spielmann, Maxwell, et al., 2013). We believe the key in interpreting this effect is to remember that along with anxiously attached individuals, secure individuals also view the rewards of relationships as highly important. Thus, the null association between anxiety and reward does not mean that those high in anxious attachment do not see opportunity for reward in their relationships, but rather that both secure and anxious individuals see strong opportunities for reward (Impett & Gordon, 2010; Rognoni et al., 2008; Vrtička et al., 2012).

The current research also provides evidence that perceptions of reward are associated with individual differences in attachment avoidance. This finding is consistent with existing work showing that individuals high in attachment avoidance see social relationships as more boring and less emotionally positive (Rognoni et al., 2008; Spielmann, Maxwell, et al., 2013; Vrtička et al., 2012). More importantly, the negative association between attachment avoidance and commitment was mediated by lower perceptions of reward. Thus, a key reason why individuals high in attachment avoidance are less committed to their romantic partners (Etcheverry et al., 2012; Kirkpatrick & Davis, 1994; Simpson, 1990) appears to be because they expect to get less out of their relationships than those lower in avoidance.

Attachment avoidance was unrelated to perceptions of threat, indicating that avoidantly attached individuals do not report less potential for rejection in relationships than more securely attached individuals. Again, this null result may seem somewhat surprising given the well-documented tendency for those high in attachment avoidance to suppress, dismiss, and downplay threat (Mikulincer, Birnbaum, Woddis, & Nachmias, 2000). However, this null relation between avoidance and threat is consistent with prior work (when controlling for anxious attachment; Spielmann, Maxwell, et al., 2013). It is possible that this null relation between avoidance and threat could be accounted for by mutually opposing effects, with avoidants' insecurity heightening perceptions of social threat which then stimulate defensive processes to reduce this sense of

⁵ We would like to thank an anonymous reviewer for insightful suggestions regarding the importance of threats and rewards (and attachment anxiety and avoidance) based on the progression of a relationship and the relational process under consideration (i.e., trust vs. commitment).

threat back to “baseline” levels (e.g., Mikulincer et al., 2000). In any event, the current results suggest that the strong focus of much of the prior research on avoidantly attached individuals’ management of threat, may have diverted attention away from their perceptions of relationship rewards. Our findings suggest that attachment avoidance is associated with lack of perceived reward, and that these lower perceptions of reward may undermine avoidantly attached individuals’ commitment to their romantic relationships.

Overall, our research provides additional support for the idea that attachment anxiety and avoidance are separate dimensions that operate on relationship outcomes through different processes (e.g., Mikulincer & Shaver, 2007; Simpson, 2007). The unique association between attachment anxiety and higher threat perceptions suggests that attachment anxiety may be particularly important in the establishment of trust between relationship partners. In contrast, the unique association between attachment avoidance and lower reward perceptions suggests that attachment avoidance may play an important role in inhibiting the development of relationship commitment.

Strengths, Limitations, and Future Directions

The current results point to the value of considering social threats and social rewards as independent constructs in understanding the regulation of commitment in romantic relationships. With large sample sizes providing considerable power, our models consistently showed that perceptions of connection and intimacy (i.e., social reward) were statistically independent from concerns over rejection and negative evaluation (i.e., social threat). In turn, the results showed that these two constructs have their own constellations of relations with attachment insecurity and constructs from the investment model. Whereas social threats were associated with higher attachment anxiety, lower satisfaction, and higher perceptions of quality of alternatives, social rewards were associated with lower attachment avoidance and more positive outcomes for all facets of commitment. Overall, we believe these data support our position that whereas feeling free of negative evaluation is an important part of fulfilling the need to belong, it is those individuals with whom people feel a seemingly “magical” connection or chemistry that provide the most irresistible draw.

Our research approach involved several important strengths. First, we tested our hypotheses using structural equation models in three separate samples. Such replication with this analysis method is relatively rare, as articles using structural equation models are most often single-study articles due to the large sample sizes required. Second, our model is theoretically thorough, integrating multiple foundational relationship constructs (i.e., attachment security, investment model) with our social reward/threat perspective. Third, rather than using undergraduates as participants, we collected data from the larger community in all three of our studies. Our participants were in their late 20s and early 30s, on average, and represented a wide range of age groups, resulting in a sample that is more representative of the general population than the typical undergraduate sample (Henrich, Heine, & Norenzayan, 2010). Fourth, we replicated our results using both correlational and experimental methods. Thus, we can have some confidence that social rewards lead to a greater willingness to commit to a partner. Furthermore, the second correlational study was an exact

replication of the first study, in line with recent calls for exact rather than conceptual replications in psychology (Simmons et al., 2011). Such replication coupled with an adequately powered analysis gives us increased confidence in the effects reported here. Finally, we tested our effects while controlling for all other effects in the models. Thus, we can be sure that these findings show the independent effects of social rewards and threats on relationship commitment and investment model constructs.

Despite the strengths of our studies, there are also some limitations that need to be noted. First, participants completed our questionnaires under what could be called control conditions, rather than under conditions of relationship threat. Both attachment theory and the risk regulation perspective suggest that relationship dynamics most closely associated with insecurity are particularly likely to arise when some threat to the relationship must be managed. Thus, although the current data suggest an important role for relationship rewards, it is possible that our model would take a different form if assessed under conditions of acute relationship threat. Second, all constructs employed in our model are measured at the explicit level. Although explicit assessments of relationship threats and rewards have consistently demonstrated statistical independence, implicit feelings of threat have been shown to dampen reward-related constructs (e.g., Cavallo et al., 2009). Thus, our model cannot speak directly to the interplay between the implicit and explicit levels of threats and rewards. This is an important direction for future research.

Third, although work on the investment model construes satisfaction as a calculus of rewards minus costs (e.g., Rusbult, 1983), we did not have a measure of costs in our study. Costs include the time, effort, and resources people spend in order to maintain their relationship (e.g., traveling to see the partner, money spent on the relationship), as well as factors outside of a person’s direct behavioral investment into the relationship, such as tolerating a partner’s negative characteristics or behaviors (Clark & Grote, 1998). Although costs (i.e., spent resources) appear to be a considerably different construct than social threat perceptions (i.e., perceived negative evaluation from the partner), our data are unable to speak directly to the relation between costs and social threats. It is certainly possible that individuals who worry more about rejection see higher costs associated with their relationship. This hypothesis is worthy of investigation in future research.

Finally, our samples primarily consisted of participants from the United States, which is known to be high in individualism (Markus & Kitayama, 1991). In such a culture where satisfying one’s own needs is highly valued, maximizing the personal rewards of intimacy and connection may be a particularly strong motivating force. However, it is not clear how people from more collectivistic nations (with a stronger sense of family obligation and a weaker sense of personal need fulfillment through relationships; Ingholsby, 1995) may utilize social threat and reward perceptions in commitment processes. Furthermore, although our participants represented people from a relatively reasonable range of ages, people from older age groups were not well represented in the samples. In the future it will be important to examine the relative importance of threats and rewards for older adults. Existing work shows that older adults focus more on positive than negative information in their environment (Reed & Carstensen, 2012); thus, it is possible that social rewards become even more important than social threats with increasing age.

Despite these limitations, our study takes an important step in simultaneously examining the importance of social threat and reward perceptions for relationship commitment in the context of attachment theory. In three studies with relatively large samples and using structural equation models, we demonstrated that attachment avoidance is uniquely associated with lower reward perceptions, whereas attachment anxiety is uniquely associated with stronger threat perceptions. Furthermore, we showed that both reward and threat perceptions played important roles in how people perceive and regulate their relationship investment, satisfaction, quality of alternatives, and commitment. Thus, we believe that the integration of perceptions of social reward and social threat, as well as individual differences that influence these perceptions—including attachment avoidance and anxiety—will be required for any complete model of the regulation of commitment in close relationships.

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