

How Self-Esteem and Executive Control Influence Self-Regulatory Responses to Risk

by

Justin Vincent Cavallo

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## Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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## Abstract

People with high (HSEs) and low self-esteem (LSEs) often react differently to interpersonal risk. When concerns about their relationship are salient, HSEs seek connection with their partners to quell feelings of vulnerability whereas LSEs distance themselves from their partners to minimize the impact of potential rejection. In the present research, I investigate the extent to which these regulatory dynamics reflect executive-based processes that govern broader regulatory responses. In Studies 1 and 2, HSEs exhibited stronger approach goals (i.e., a greater tendency to pursue rewards and ignore risks) in non-social domains when faced with interpersonal risk whereas LSEs inhibited approach goals and made more conservative decisions. In Studies 3 and 4, I demonstrated that HSEs' and LSEs' divergent regulatory responses to risk were contingent on executive control. When participants were cognitively busy, HSEs were less likely to bolster relationship evaluations in the face of interpersonal risk whereas LSEs were more likely to do so. Finally, Study 5 demonstrated that these global regulatory strategies govern HSEs' and LSEs' responses to non-interpersonal risk as well. HSEs were more willing to engage in risky social comparison following failure than they were when they received neutral feedback about their performance, whereas LSEs were less willing to compare themselves with others after failure. These effects did not emerge when cognitive resources were depleted. Taken together, the results suggest that HSEs' and LSEs' self-regulatory responses to risk are broader and more controlled than previously theorized.

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## Introduction

Intimate bonds with close others – particularly romantic partners – offer a host of positive psychological benefits and are a prime contributor to well-being (Uchino, Cacioppo, & Kiecolt-Glaser, 1996). However, entering into such relationships entails a substantial degree of risk. They have the potential to elicit many negative emotions and dissolving interdependent relationships can result in a great deal of distress (Mearns, 1991; Simpson, 1987). To obtain the benefits of close relationships, people must set aside apprehensions and pursue goals that serve to foster and sustain intimacy with romantic partners. A considerable amount of research has revealed that intrapersonal beliefs about one's own self-worth play a critical role in allowing people to do this. Those high in self-esteem (HSEs) tend to pursue connectedness goals readily whereas those low in self-esteem (LSEs) are more averse to risk and pursue self-protection goals in interpersonal contexts (Murray, Holmes, & Collins, 2006).

In the present research, I explore the nature of these regulatory dynamics. Specifically, I propose that the different regulatory strategies of HSEs and LSEs stem from the operation of broader executive-based processes that govern general goal pursuit. I suggest that when faced with risk, HSEs counteract concerns by bolstering global focus on positive outcomes. They set aside potential risk to pursue the rewards that accompany it. In contrast, I propose that LSEs inhibit focus on positive outcomes in the same situations. They relinquish potential rewards and attend more vigilantly to risk when self-regulating. Moreover, I propose that this process is reliant on executive control. When cognitive resources are depleted, I anticipate that self-esteem will influence responses to risk considerably less than it does when such resources are available. By exploring the scope and operation of these regulatory strategies, I hope to contribute to the



understanding of how interpersonal relationships can affect self-regulation more broadly, and to clarify the nature of self-esteem's influence on regulatory functions.

### **Regulating Interpersonal Risk**

Interdependent relationships often present people with a unique motivational conflict. Pursuing intimacy and closeness with relationship partners allows people to fulfill fundamental belongingness goals (Baumeister & Leary, 1995). However, frequently the behaviors and cognitions that foster intimacy require people to cede control over their outcomes to their relationship partner and thereby leave them vulnerable to rejection (Kelley & Thibaut, 1978; Murray et al., 2006). For example, responding benevolently to partners' transgressions fosters relationship intimacy (Overall & Sibley, 2008; Rusbult, Verette, Whitney, Slovik, & Lipkus, 1991) but may lead to painful rejection if partners exploit such accommodations. Similarly, disclosing privileged information about oneself can enhance intimacy, but carries significant costs if partners are unresponsive (Laurenceau, Feldman Barrett, & Pietromonaco, 1998; Reis & Shaver, 1988). Such relationship-promotive behaviors often conflict with people's strong motivation to avoid social pain (MacDonald & Leary, 2005). This dilemma is particularly evident in romantic relationships, which afford unparalleled opportunities to satisfy social connection needs (Le & Agnew, 2001) that are often coupled with risk. Seeking closeness and intimacy with relationship partners is risky not only because it necessitates that people think and act in ways that heighten the likelihood of rejection, but also because greater interdependence exacerbates the distress that would be experienced if the relationship were to end (Murray et al., 2006).

This motivational tension is heightened when people come under relationship threat. That is, when relationship events (e.g., arguments) elicit acute concerns about rejection, relationship-

promotion goals come into sharp conflict with self-protection goals. To avoid impasse between these competing motivations, people must prioritize one goal over the other and enact a behavioral response (Cacioppo, Gardner, & Berntson, 1999). In their theory of interpersonal risk regulation, Murray, Holmes, and Collins (2006) proposed the existence of a regulatory system that facilitates resolution of this goal competition.

The interpersonal risk regulation system serves to maximize people's assurance that they are safe in their level of dependence on their partner and therefore relatively immune from being hurt (Murray et al., 2006; Murray, Derrick, Leder, & Holmes, 2008). When concerns about interpersonal risk are salient, the risk regulation system operates to prioritize connectedness or self-protection goals depending on expectations about a romantic partner's responsiveness. Those who feel accepted, valued, and cared for by their romantic partners – that is, confident in their partner's regard – respond to risk by setting aside self-protective concerns and seeking connection with their partners in order to quell the threat of rejection. In contrast, those who doubt their partner's regard respond to risk by prioritizing self-protection goals. They attempt to minimize dependence on their partners by thinking and behaving in ways that effectively distance themselves from their relationships. By devaluing their relationships in various ways, people low in perceived regard are assured that if rejection does occur, it will be a less painful experience (Murray et al., 2006; Murray, Bellavia, Rose, & Griffin, 2003).

### **The Role of Self-Esteem**

Though interpersonal risk regulation is a normative process, a large body of research indicates that individual differences in chronic perceptions of a partner's regard play a critical role in determining goal prioritization in the face of relationship threats (Murray et al., 2003; Murray, Rose, Bellavia, Holmes, & Kusche, 2002). In most empirical investigations, such

differences have been operationalized by examining participants' self-esteem. Beliefs about one's self-worth are highly associated with perceptions of relational value (Leary & Baumeister, 2000; Leary, Tambor, Terdal, & Downs, 1995) and as such, are a highly reliable indicator of perceived regard. These chronic differences moderate regulatory responses to relationship risk.

High self-esteem people (HSEs) are eminently confident in their partner's regard. This confidence allows them to prioritize connectedness goals over self-protection goals in the face of relationship threat. They set aside rejection concerns and draw their partners closer to them, thereby affirming their relationships in situations of vulnerability (Murray et al., 2002). In contrast, low self-esteem people (LSEs) harbor persistent and often unwarranted doubts about their partners' regard (Murray, Holmes, Griffin, Bellavia, & Rose, 2001). As such, they respond to relationship threat by prioritizing self-protection goals. When risk is salient, LSEs functionally distance themselves from their relationship partners both cognitively and behaviorally. Devaluing their relationship in this manner serves to minimize the impact of rejection that LSEs believe is imminent.

Evidence of such discrepant responses to relationship risk by HSEs and LSEs has been found in both laboratory and naturalistic contexts. When relationship threat was induced by leading participants to believe their partners perceived an inordinate number of faults in their relationship, LSEs reported being less close to their partners and evaluated their partners more negatively relative to participants in a control condition. In contrast, HSEs reported being *closer* to their partners and rated them more positively when threatened (Murray et al., 2002). Similarly, a daily diary study of married couples revealed that people's responses to relationship stressors also diverged as a function of self-esteem. When they felt hurt by their partners, LSEs prioritized self-protective goals and enacted them by treating their partners more coldly and critically the

following day. HSEs displayed an opposing tendency to prioritize connectedness goals. They pursued these goals by behaving more positively toward their partners following days in which they felt hurt, thereby compensating for feelings of vulnerability by responding constructively (Murray et al., 2003).

When challenged by conflict between self-protection and connectedness goals, HSEs and LSEs consistently employ different self-regulatory strategies to resolve it. In the present research, I propose that such responses to interpersonal risk stem from the operation of broader self-regulatory mechanisms than previously theorized. That is, I propose that many of the effects observed in interpersonal risk regulation research reflect the application of procedural rules that govern risk-taking more generally. Additionally, I contend that these broad responses are not only displayed following interpersonal risk, but also direct self-regulation in the face of non-interpersonal risk as well.

### **Approach and Avoidance Motivation in the Face of Risk**

In the present research, I suggest that connectedness and self-protection goals, as conceptualized by Murray et al. (2006), reflect fundamentally different underlying motivations that can be categorized as approach and avoidance, respectively. Approach and avoidance motivations have been theorized to guide goal pursuit and behavior independently of one another and are thought to be central to human activity (Elliot & Church, 1997; Elliot, Gable, & Mapes, 2006; Gable, 2006; Higgins, 1997). Approach motivation directs behavior toward positive stimuli. It guides action toward achieving or maintaining desired end-states, leading one to behave in ways that foster rewarding outcomes. In contrast, avoidance motivation directs behavior away from negative stimuli. An avoidance-oriented goal guides action away from

undesired end states, producing behaviors aimed at preventing or evading aversive outcomes (Elliot, 2006).

In the interpersonal risk regulation model, connectedness goals are decidedly approach-oriented. These goals center on the attainment of intimacy and closeness, a positive outcome that people are willing and able to pursue when rejection concerns are minimal. Conversely, self-protection goals may be conceptualized as avoidance-oriented goals. The focus of these goals is on avoiding the negative end-state of being hurt or rejected by a romantic partner, and they produce behaviors that are ultimately intended to buffer against such negative outcomes (Murray et al., 2002). I believe that the conceptual overlap between the relationship-specific goals outlined in the romantic risk regulation model and broader approach/avoidance motivation goes beyond theoretical similarities and instead reflects the fact that interpersonal risk regulation processes are inherently linked with a more general regulatory system.

I hypothesize that the divergent ways in which high and low self-esteem people regulate risk in interpersonal contexts is a specific instantiation of basic regulatory processes that govern general approach and avoidance behaviors across all domains. I theorize that relationship threat arouses motivational tension between global approach and avoidance motivations. Because this ambivalence makes it difficult to enact a clear regulatory response (Cacioppo et al., 1999), people must reconcile these competing motivations (Murray et al., 2008). I propose that HSEs and LSEs resolve this goal conflict by shifting their approach motivation, albeit in different directions.

In situations where risk is salient, HSEs experience heightened global approach motivation that directs them toward positive outcomes generally. This strengthened approach motivation allows them to override competing avoidance motivation and in relationship contexts,

manifests itself in relationship-promotive cognitions and behaviors that serve to restore relational security. In contrast, LSEs respond to relationship threat with *inhibited* approach motivation. Because LSEs generally hold strong avoidance goals (Heimpel, Elliot, & Wood, 2006), a decreased focus on positive outcomes allows this opposing motivation to exert a greater influence on self-regulation. In a general relationship context, the resulting prioritization of strong avoidance motivation drives LSEs to withdraw and distance themselves from their romantic partner, thereby reducing the risk of painful rejection. However, I anticipate that because broader self-regulatory processes drive such responses, relationship-specific threats should influence HSEs' and LSEs' goal-directed actions in unrelated and non-relational domains as well.

### **The Need for Executive Control**

In addition to demonstrating that HSEs and LSEs employ divergent broad regulatory strategies to manage risk, I also hope to show that such responses are not enacted automatically but instead require executive control to implement. When potential hazards threaten opportunities for reward, HSEs and LSEs must engage in self-control processes to direct themselves toward their preferred goals and resist the influence of alternative goals. For HSEs to bolster approach motivation when risk is salient, they must counteract the motivation to avoid risk that is equally likely to be activated in these contexts for them as it is for LSEs (Cavallo, Fitzsimons, & Holmes, 2010; Downey, Mougios, Ayduk, London, & Shoda, 2004). Conversely, for LSEs to pursue self-protective goals, they must inhibit approach motivation and forego outcomes that they have a strong desire to obtain. Though LSEs and HSEs desire acceptance to a similar degree (e.g., Leary et al., 1995), LSEs are particularly likely to stifle this desire in risky situations (Anthony, Wood, & Holmes, 2007).

Prior research on self-regulation has revealed that exerting self-control requires people to have sufficient executive resources available to them (Muraven & Baumeister, 2000). Thus, I hypothesize that executive control is critical in allowing HSEs and LSEs to implement their self-regulatory aims when risk is salient. I propose that when this executive function is impaired, self-esteem will have little bearing on how people regulate in risky situations.

This logic contrasts somewhat with mainstream theorizing about the nature of self-esteem, which has been conceptualized as having a relatively automatic influence on cognition and behavior (see Baumeister, 1993). Indeed, mental processes often have both automatic and controlled components (Bargh, 1994) and the influence of self-esteem on regulatory responses to risk may be nonconscious in many respects. For example, it is likely that people have little awareness of the extent to which self-esteem influences goal pursuit, and it is highly unlikely that people are aware of how interpersonal risk shapes self-regulation in other domains. It is also probable that the mere presence of risk initiates HSEs' and LSEs' regulatory responses relatively immediately without requiring conscious intentionality. Critically, however, I contend the self-esteem's influence on self-regulation following risk is more controlled than previously assumed. In order for HSEs and LSEs to obtain their preferred regulatory objectives and withstand motivational competition from other possible goals, they must have sufficient executive resources. If this is indeed the case, taxing or usurping these resources will result in self-esteem being less central in determining how people regulate pursuit of reward in the face of risk.

More specifically, I contend that resolving motivational conflict requires HSEs and LSEs alike to exert cognitive effort to apply the procedural rules that best suit their preferred regulatory strategies. I hypothesize that self-esteem is less influential in determining responses to risk when cognitive resources are depleted and people are less able to reconcile competing goals.

Under such conditions, I theorize that LSEs will lessen their tendency to inhibit approach motivations and instead will exhibit a greater willingness to pursue positive outcomes when risk is salient. In contrast, I anticipate that disrupting executive control may encourage HSEs to be more *cautious* when threatened. I predict that resource depletion will impair HSEs' ability to prioritize approach motivation and will lead them to be less tolerant of risk both in and out of relationship contexts.

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

In the present research, I sought to expand theorizing on how high and low self-esteem people self-regulate in the face of risk. I hypothesized that the prioritization of connectedness and self-protection goals in the face of relationship threat by HSEs and LSEs respectively, reflects the operation of a broader regulatory system that governs risk-taking more generally. I expected that when faced with interpersonal risk, HSEs and LSEs would display differential shifts in broader approach-oriented goals that would be reflected in self-reports of goal orientation and in decision making outside of relationship domains. In Studies 1 and 2, I tested the hypothesis that interpersonal risk would lead HSEs to bolster approach motivation and thus make riskier decisions and that LSEs would respond to risk by inhibiting approach motivation and making more conservative decisions.

I also predicted that these regulatory responses to threat require executive control to carry out. I demonstrate this in Studies 3 and 4 by examining how undermining cognitive resources attenuates the influence of self-esteem on relationship-specific risk regulation. Finally, in Study 5 I explore how these executive-based regulatory strategies are used by HSEs and LSEs to negotiate risk outside of interpersonal contexts. Because these strategies affect global motivations, I contend that they are elicited not only by interpersonal risk but by non-



interpersonal risk as well. I show that self-esteem predicts willingness to engage in social comparison after failure, but only when executive resources are not impaired. Using a variety of manipulations and measures, I demonstrate that the divergent risk regulation strategies of HSEs and LSEs are broader than previously theorized and require executive control to implement.

## **Study 1: Interpersonal Risk and Approach Motivation**

In Study 1, I tested my hypothesis that relationship-specific threat affects broader motivational shifts by examining participants' self-reports of general approach and avoidance motivations across a number of non-social domains. I predicted that following a threat to relationship security, HSEs would report stronger general approach motivation relative to HSEs in a no-threat control group. In contrast, I anticipated that LSEs under threat would report decreased approach motivation relative to participants in a no-threat control group. Although my theoretical predictions centered largely on approach motivation, I also examined participants' self-reported avoidance motivation. However, because I theorized that LSEs' pursuit of self-protective goals in response to threat results largely from inhibited approach motivation in conjunction with chronically high avoidance motivation, I did not expect avoidance to be significantly affected by threat nor did I predict an interaction between self-esteem and experimental condition on this measure.

To demonstrate that shifts in motivation aroused by interpersonal risk are truly global, I assessed the extent to which they affected self-regulation outside of relationship contexts. Specifically, I chose to examine risky decision making as a means of capturing broader self-regulatory strategies. By definition, risky decisions provide opportunities for lucrative rewards but are accompanied by a substantial degree of risk. For example, wagering a considerable amount of money on an underdog in a sporting event may ultimately be profitable if successful, but there is a significant risk of losing the wager if unsuccessful. These types of decisions are highly subject to influence from general approach motivation. Approach motivation is known to guide behavior in ways that serve to attain or preserve positive stimuli. Accordingly, approach-oriented goal pursuit is sensitive to the presence or absence of positive outcomes (Elliot, 2006;

Higgins, 1997) and influences the extent to which people engage in “risky” behaviors (Atkinson, 1957; Crowe & Higgins, 1997). I anticipated that stronger (vs. weaker) approach motivation should make participants more attentive to the benefits of a given decision and more likely to overlook the risky implications of that decision. Thus, I hypothesized that HSEs would show a stronger approach orientation following threat and consequently would be less averse to risk in this condition. I expected LSEs to become less approach-oriented in the threat condition and less likely to make risky decisions.

## **Method**

**Participants.** Fifty undergraduates (27 female, 23 male;  $M_{age} = 21.00$ ,  $SD = 2.89$ ) who were currently in romantic relationships participated in exchange for credit in their introductory psychology class. The mean relationship length was 24.41 months ( $SD = 20.63$ ).

**Procedure.** Upon arrival at the laboratory, participants were told that the experiment examined memory processes. The experimenter handed participants a written passage and asked them to read it carefully. She informed them that they would be asked to recall details from it later in the study and allowed them as much time as they wished to read it before collecting it.

This passage provided a summary of research findings ostensibly collected by psychologists at the University of Waterloo over several years and served as the manipulation of relationship threat. In this passage, participants were told that people generally lack information about what types of behaviors and motivations are normative in romantic relationships and consequently, that their own relationship evaluations may be inaccurate. To illustrate this point, the passage depicted a week in the life of ‘Brad’ and ‘Katie’, a fictional university-aged dating couple. Throughout the week, the couple experienced relationship events typical of interdependent relationships that required them to negotiate conflicting interests (e.g., deciding

which film to attend on a date). The text described several events and outlined how Brad and Katie resolved each scenario. These descriptions were annotated with “interpretations” of what the event and its resolution implied about the couple’s relationship. These annotations were offset from the main body of the text and were written in an academic tone, giving them the appearance of being developed on the basis of earlier research findings. The content of these interpretations varied between experimental conditions.

In the threat condition, participants read a version of the passage that described how people generally *overestimate* the quality of their romantic relationships. The interpretations offered for Brad and Katie’s relationship events indicated that these events, while common, are often indicative of a lack of regard by one’s romantic partner. For example, after the couple negotiated which movie to see, participants were told, “research shows that although making small concessions are part of romantic life, people underestimate the ability of even trivial compromises to build resentment toward their romantic partner.” To reduce defensive reactions to the threat, I took care to ensure these interpretations were not uniformly negative but instead simply introduced some doubt to participants’ evaluations of their own romantic relationship.

In the no threat condition, participants were told that people generally *underestimate* the quality of their romantic relationships. The interpretations of the relationship events provided in this version of the passage indicated that these common events were often reflective of good relationship functioning. For example, the interpretation that followed a description of the couple’s movie compromise read, “Small concessions such as this one are highly characteristic of romantic life and the ability to make seemingly trivial compromises is often integral to the success of a romantic relationship.” Pilot testing of this manipulation confirmed that HSE and LSE participants who read the threat passage reported lower perceived regard and higher anxiety

about their own relationships relative to those who read the no threat passage, indicating that the manipulation was effective.

After participants read the passage, the experimenter directed them to a computer that guided them through the remainder of the experiment. They completed a measure of general approach and avoidance goals and a measure of risky decision making. To maintain the cover story, they were asked to recall details of the passage before being thanked and debriefed.

### **Measures.**

*Self-esteem.* Rosenberg's (1965) 10-item scale was used to measure self-esteem (e.g., "I take a positive attitude toward myself") and was administered as part of a mass-testing questionnaire at the beginning of the academic term. Participants responded to each item using a 1 (*strongly disagree*) to 9 (*strongly agree*) scale. Scores were averaged across the 10 items ( $\alpha = .92$ ).

*Approach and avoidance motivation.* To assess the strengths of participants' approach and avoidance motivations, I chose an 18-item scale originally developed by Lockwood, Jordan, and Kunda (2002) to assess regulatory focus orientation (Higgins, 1997). I deemed it appropriate to use as a measure of approach and avoidance based on emerging research (Summerville & Roese, 2008) demonstrating that this scale captures these constructs as well. Nine items of this scale ( $\alpha = .82$ ) assessed participants' endorsement of general approach motivation, that is, their global focus on pursuing positive outcomes (e.g., "In general, I am focused on achieving positive outcomes in my life"). The other nine items in the scale ( $\alpha = .84$ ) assessed participants' focus on avoiding negative outcomes and captured general avoidance motivation (e.g., "In general, I am focused on preventing negative events in my life"). Participants responded to each item using a 1 (*not at all true of me*) to 9 (*very true of me*) scale. Although this measure was initially designed

to assess chronic individual differences, I was confident that it would also capture situational changes produced by the relationship threat manipulation.

*Risky decision making.* To assess participants' risky decision making, I adapted a measure from Wallach, Kogan, and Bem (1962). This well-known 10-item measure presents participants with scenarios situated in a number of diverse domains. In each scenario, participants are faced with a dilemma that has two possible courses of action. One option is safe, but relatively unrewarding. The alternative option is more lucrative but entails a substantial degree of risk. For example, one item states, "The quarterback of a professional football team is in the final seconds of the Super Bowl. He may choose a play that is almost certain to produce a tied score, or he may choose a more risky play that will lead to certain victory if successful and sure defeat if it fails." Participants were asked to indicate the minimum probability that the risky option would be successful they would accept before endorsing it over the safe alternative. Participants responded on a 6-point scale labeled '10%', '30%', '50%', '70%', '90%' and 'I wouldn't recommend the risky option at all'. Responses were reverse coded such that higher numbers indicated riskier decision making and scores were averaged across all 10 items ( $\alpha = .60$ ).

It is important to note that this measure required participants to evaluate risk and reward across a number of domains yet none of these domains were explicitly social in nature. By assessing risky decision making in non-social scenarios, I was confident that differences observed in this measure could be attributed to a global focus on positive outcomes and not with specific relationship-promotion or self-protection goals that are commonly found in the interpersonal risk regulation literature.

## Results

To test my hypothesis that self-esteem would moderate self-reported approach motivation and risky decision making in the face of threat, I regressed each of the dependent measures onto centered self-esteem scores and experimental condition (dummy coded, such that 0 = no threat condition and 1 = threat condition) in the first step and the two-way interaction in the second step. Following Aiken and West (1991), simple effects were calculated for HSEs at one standard deviation above the mean and for LSEs at one standard deviation below the mean of participants' self-esteem scores. Predicted means for the various analyses are presented in Table 1.

**Approach strength.** Did HSEs and LSEs report shifts in approach motivation when faced with relationship threat? The analysis predicting approach goal strength revealed no main effect of condition,  $\beta = .01$ ,  $t(47) = .10$ ,  $p = .92$ , and a main effect of self-esteem,  $\beta = .34$ ,  $t(47) = 2.43$ ,  $p = .02$ , that was qualified by the hypothesized interaction,  $\beta = .52$ ,  $t(46) = 2.51$ ,  $p = .02$ . As predicted, HSEs under threat reported stronger approach motivation relative to HSEs in the no threat condition,  $\beta = .34$ ,  $t(46) = 2.58$ ,  $p = .01$ . In contrast, LSEs exhibited weaker approach goals under threat,  $\beta = -.34$ ,  $t(46) = -2.58$ ,  $p = .01$ . Analysis of simple slopes revealed that as anticipated, HSEs were significantly more approach-oriented than LSEs under relationship threat,  $\beta = .61$ ,  $t(46) = 3.58$ ,  $p = .001$ , but HSEs and LSEs did not differ in the no-threat condition,  $\beta = -.06$ ,  $t(46) = -.31$ ,  $p = .76$ .

**Avoidance strength.** Analysis of avoidance goal strength revealed no main effect of condition,  $\beta = -.14$ ,  $t(47) = -.98$ ,  $p = .33$ , nor a significant interaction,  $\beta = .18$ ,  $t(46) = .82$ ,  $p = .42$ . However, there was a main effect of self-esteem such that LSEs were significantly more avoidance-oriented than HSEs regardless of experimental condition,  $\beta = -.33$ ,  $t(47) = -2.32$ ,  $p =$

.03. This finding is consistent with prior research demonstrating a negative relationship between self-esteem and avoidance motivation (Heimpel et al., 2006).

**Risky decision making.** Analysis of participants' risky decision making revealed neither a main effect of condition,  $\beta = .14$ ,  $t(47) = .92$ ,  $p = .36$ , nor a main effect of self-esteem,  $\beta = -.05$ ,  $t(47) = -.32$ ,  $p = .76$ . However, the hypothesized interaction was significant,  $\beta = .49$ ,  $t(46) = 2.22$ ,  $p = .03$ . As predicted, HSEs were significantly riskier in the threat condition than in the no threat condition,  $\beta = .44$ ,  $t(46) = 3.15$ ,  $p = .003$ . LSEs' risky decision making was unaffected by the threat manipulation,  $\beta = -.20$ ,  $t(46) = -1.42$ ,  $p = .16$ . Analysis of simple slopes revealed that HSEs were actually marginally less risky than LSEs in the no threat condition,  $\beta = -.42$ ,  $t(46) = -1.92$ ,  $p = .06$ . However, this unexpected difference was eliminated, and indeed reversed, by the threat manipulation,  $\beta = .21$ ,  $t(46) = 1.17$ ,  $p = .25$ .

Table 1  
*Predicted Scores for the Condition X Self-Esteem Interactions in Study 1*

Dependent measure	Low self-esteem		High self-esteem	
	No threat	Threat	No threat	Threat
Approach strength	7.03	6.37	6.91	7.57
Avoidance strength	6.17	5.38	4.74	4.67
Risky decision making	3.79	3.56	3.33	3.81

*Note.* Low and high self-esteem refer to participants one standard deviation above and below the mean, respectively.

## Discussion

Taken together, the results of Study 1 provided evidence that interpersonal risk elicits broad regulatory shifts. Consistent with predictions, self-esteem positively predicted self-



reported approach motivation in the face of relationship threat, but not in the control condition, with HSEs reporting stronger approach motivation and LSEs reporting weaker approach motivation when threatened. This finding parallels the findings in the risk regulation literature that HSEs pursue relationship connectedness goals to a greater degree than LSEs when rejection concerns are salient and suggests that approach motivation activated by relationship risk may be partly responsible for this prevalent finding.

Also consistent with prior research was the finding that LSEs endorsed avoidance goals more strongly than HSEs regardless of the presence of threat. These results support my hypothesis that LSEs' prioritization of self-protection goals in response to threat results from a perpetually strong global avoidance motivation combined with inhibited global approach motivation. It appears that relationship threat substantially diminishes LSEs' motivation to pursue positive outcomes but has little effect on their chronically high motivation to avoid negative outcomes. These data are congruent with previous research demonstrating that LSEs' willingness to pursue connectedness goals increases with relationship duration. However, their motivation to self-protect does not diminish over time, but instead remains strong throughout the course of their relationships (Murray et al., 2008). While avoidance goals are a key component of the risk regulation system, it seems that approach-oriented goals are most likely to fluctuate when negotiating interpersonal risk (Park, 2010).

It is important to note that the measure of approach/avoidance that I employed as a dependent variable was originally intended to capture chronic individual differences in regulatory focus (Lockwood et al., 2002). Although there is currently some question as to whether this scale adequately captures the theoretical distinctions of regulatory focus theory (Summerville & Roese, 2008), the scale does capture approach and avoidance motivations to the

extent that it measures participants' tendency to focus on positive versus negative outcomes. The fact that my relationship-specific threat manipulation was able to produce changes in global approach motivation supports my hypothesis that previously established romantic risk regulation processes (e.g., Murray et al., 2002) may reflect broader regulatory strategies.

The results of Study 1 also revealed that HSEs became less averse to risk when under relationship threat. When making risky decisions, they required less certainty that a risky (but lucrative) option would be successful before endorsing it and reported stronger approach goals relative to LSEs in the face of threat. The finding that relationship threat led HSEs to make less conservative decisions is consistent with my hypothesis that interpersonal risk regulation processes are inherently related to broader approach/avoidance regulatory strategies. HSEs' heightened approach goals in response to threatening information about their romantic relationship led them to overlook risks and pursue rewards in completely unrelated domains. This general inclination toward approach may account in part for relationship-promotion behaviors seen in prior risk regulation research.

The findings for LSEs on this measure were less clear. LSEs' risky decision making was unaffected by the threat manipulation and I found an unexpected negative relationship between self-esteem and riskiness in the no threat condition but not in the threat condition. It is important to note, however, that this baseline difference was eliminated by HSEs' response to relationship threat. The emergence of this predicted effect supports my hypothesis that relationship threat can affect the extent to which people attend to potential gains rather than to potential losses in their general decision making.

I sought to build on these initial findings of Study 1 by replicating them in Study 2. In this next study, I wanted to examine if a similar pattern of results would emerge for risky

decisions that had greater implications. The risky decisions examined in the Study 1 were hypothetical and were made on behalf of others. Without any real consequences, it may have made it relatively “safe” for HSEs to make more risky behavioral decisions. In Study 2, I evaluated the extent to which HSEs and LSEs under relationship threat would prioritize reward over risk when making a decision with legitimate and self-relevant real-world repercussions.

## Study 2: Interpersonal Risk and Risky Decision Making

Study 2 provided a direct test of my hypothesis that relationship threat alters the extent to which HSEs and LSEs generally approach rewards and overlook risks. In this study, I assessed participants' willingness to do this when evaluating investment opportunities at the University of Waterloo that would have impactful implications for them. Participants in this study evaluated both a risky and safe investment after being told that the dividends of this investment would directly affect the value of a potential tuition rebate. I expected that relationship threat would activate a global approach motive for HSEs and as a result, they would be particularly likely to support the risky investment. Conversely, I expected LSEs to adopt a weaker approach orientation and offer less endorsement for the risky investment when under relationship threat. Because participants were told that the consequences of their decision were real and meaningful, finding this pattern of results would lend strong support to my hypothesis that interpersonal risk elicits global regulatory strategies that guide decision making in non-relational contexts. In this study, I used a different manipulation of relationship threat (one that was more direct than that used in Study 1) to heighten the generalizability of the predicted effects.

### Method

**Participants.** Forty-four undergraduates (30 female, 14 male;  $M_{age} = 20.76$ ,  $SD = 2.65$ ) currently in a romantic relationship were recruited from the student center at the University of Waterloo. They received a candy bar for their participation. The mean relationship length was 18.59 months ( $SD = 16.34$ ). Two participants in the threat condition could not recall an instance where their partner disappointed or hurt them and were excluded from the analyses.

**Procedure.** Participants volunteered to participate in a survey about various aspects of student life at the University of Waterloo (UW) and were randomly assigned to one of two

conditions. All participants first completed the Rosenberg (1965) self-esteem measure ( $\alpha = .88$ ). Participants in the threat condition were told that as part of a general investigation into student life, researchers were interested in how people recall events that previously occurred in their romantic relationships. They were instructed to think of a time when their romantic partner did or said something that made them feel intensely hurt or disappointed. Participants described this incident in a space provided to them and then were asked to explain exactly how they felt at the time and any physical feelings that accompanied this incident. The induction of relationship threat was adapted from Murray et al. (2008) and has been shown to activate relationship-specific risk regulation goals.

Following this, participants proceeded to seemingly unrelated part of the student life questionnaire. Participants in the threat condition were presented with an article that was designed to look like an excerpt from the campus newspaper. This article claimed that the University of Waterloo, as part of a federal initiative, had been granted a large sum of money to spend at its discretion. A prominent administrator was quoted as saying that the university had already elected to use this money to give undergraduate students a tuition rebate at the end of the academic year, but would be soliciting student feedback to determine how best to manage the money in the interim months. The article presented participants with two possible investment strategies that administrators were contemplating.

The first investment option (Strategy A) was presented as dependable, but not particularly profitable. Participants were told that investing in this option would provide only low returns, but all students would be guaranteed at least a small refund. The second investment option (Strategy B) was depicted as highly profitable, but also highly risky. It was described as having a much lower probability of success and even a slight possibility of loss relative to the

first option. However, participants were told that if this investment were successful, the returns would allow UW to provide them with a much larger tuition rebate. After reading the article, participants completed a manipulation check, rated the importance of each investment strategy, and were asked to indicate how they thought the money should be allocated. Participants in the control condition completed the relationship-specific portion of the questionnaire, including the threat induction, after first completing the dependent measures about the investment strategies.

### **Measures.**

*Manipulation check.* To ensure that participants understood the article and both investment strategies, participants were asked how likely each strategy was to be successful and the extent to which each strategy had to make a large return on the initial investment. They answered these questions on a 1 (*not at all*) to 7 (*very much so*) scale.

*Risky decision making.* Participants were asked how important it was for UW to invest in each strategy, and the extent to which they thought that UW should invest the money in each of the two strategies. They gave their responses on a scale ranging from 1 (*not at all*) to 7 (*very much so*). Responses were averaged to form composites reflecting endorsement of Strategies A ( $\alpha = .87$ ) and B ( $\alpha = .81$ ). A difference score was created such that higher numbers reflected greater endorsement of the riskier, but potentially more lucrative, Strategy B. Participants were also asked to indicate what proportion of the grant money they felt should be allocated to each strategy. They wrote down a percentage value for Strategies A and B, providing an index of relative investment. Because this was a zero-sum measure, I used the percentage that participants wished to allocate to Strategy B as the dependent measure in my analyses, with higher numbers again indicating greater support for the risky strategy.

## Results

**Manipulation check.** As planned, participants found that Strategy A ( $M = 5.62$ ) was more likely to provide gains than Strategy B ( $M = 3.48$ ),  $F(1, 38) = 32.25$ ,  $p < .001$ . However, they also believed that Strategy A ( $M = 2.88$ ) was less likely to make a large return on the investment than Strategy B ( $M = 5.79$ ),  $F(1, 38) = 68.68$ ,  $p < .001$ . These differences were not affected by threat condition, self-esteem, or the two-way interaction. All participants, as intended, accurately perceived the trade-off between the risk and the reward of the two investment strategies.

**Risky decision making.** The difference score between the endorsement of Strategies A and B was regressed onto centered self-esteem scores, condition (dummy coded such that 0 = control condition and 1 = threat condition), and the two-way interaction. The values predicted by this analysis are presented in Table 2. Results revealed neither a main effect of condition,  $\beta = .10$ ,  $t(39) = .63$ ,  $p = .53$ , nor a main effect of self-esteem,  $\beta = .02$ ,  $t(39) = .13$ ,  $p = .19$ . However, the hypothesized two-way interaction was significant,  $\beta = .45$ ,  $t(38) = 2.38$ ,  $p = .02$ .

As predicted, HSEs displayed significantly greater endorsement of the risky alternative in the relationship threat condition than did those in the control condition,  $\beta = .48$ ,  $t(38) = 3.18$ ,  $p = .003$ . In contrast, LSEs' endorsement of the risky strategy was marginally lower in the threat condition than in the control condition,  $\beta = -.28$ ,  $t(38) = -1.83$ ,  $p = .07$ . Simple slopes analyses indicated that as predicted, threatened HSEs were more supportive of the risky investment strategy than threatened LSEs,  $\beta = .50$ ,  $t(38) = 1.98$ ,  $p = .06$ , whereas self-esteem did not predict endorsement of the risky strategy in the control condition,  $\beta = -.25$ ,  $t(38) = -1.33$ ,  $p = .19$ .

A similar pattern of results emerged for the amount of money participants desired to allocate to Strategy B. Analysis again revealed no main effect of condition,  $\beta = .07$ ,  $t(39) = .42$ ,  $p$

= .68, nor self-esteem,  $\beta = .06$ ,  $t(39) = .37$ ,  $p = .71$ , but did reveal a significant two-way interaction,  $\beta = .41$ ,  $t(38) = 2.13$ ,  $p = .04$  (see Figure 1). As hypothesized, HSEs were willing to allocate a significantly greater percentage of the money to the risky strategy in the threat condition relative to the control condition,  $\beta = .41$ ,  $t(38) = 2.68$ ,  $p = .01$ . For LSEs, however, the manipulation of threat lowered the amount of money they were willing to allocate to the risky strategy though this effect was marginally significant,  $\beta = -.27$ ,  $t(38) = -1.79$ ,  $p = .08$ . Under relationship threat, HSEs displayed more support for the risky strategy than LSEs,  $\beta = .49$ ,  $t(38) = 1.93$ ,  $p = .06$ , whereas HSEs and LSEs in the control condition did not differ in how much they were willing to allocate to the risky strategy,  $\beta = -.19$ ,  $t(38) = -.97$ ,  $p = .34$ .

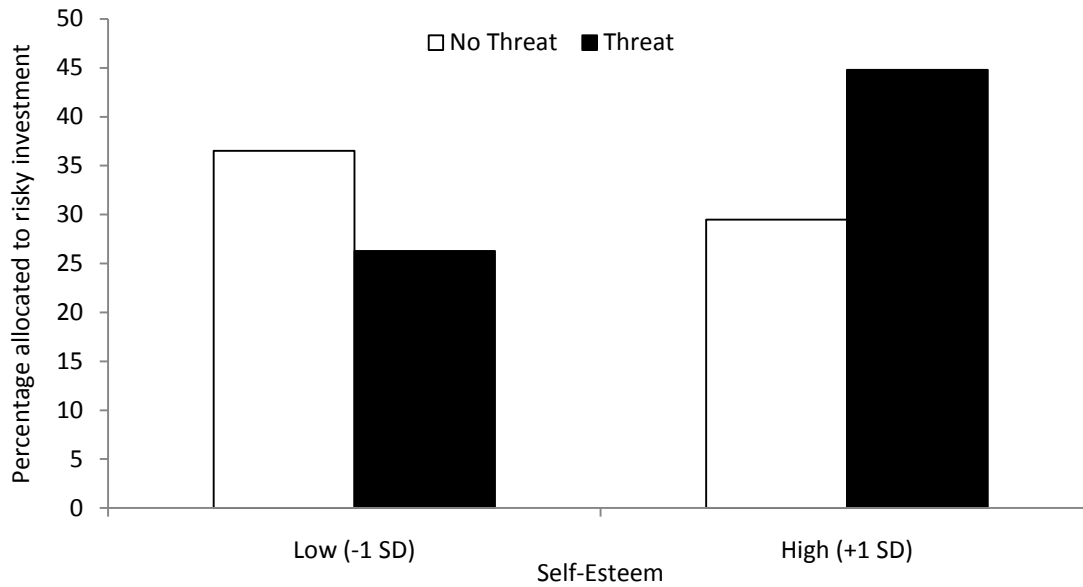
Table 2  
*Predicted Scores for the Condition X Self-Esteem Interactions in Study 2*

Dependent measure	Low self-esteem		High self-esteem	
	No threat	Threat	No threat	Threat
Endorsement of risky investment	-1.32	-2.83	-2.71	-.08
Percentage of money allocated to risky investment	36.52	26.27	29.48	44.80

*Note.* Low and high self-esteem refer to participants one standard deviation above and below the mean, respectively.



Figure 1. Percentage of money allocated to risky investment as a function of condition and self-esteem in Study 2.



## Discussion

The results of Study 2 provided further support for my hypothesis that interpersonal risk elicits divergent global regulatory strategies among HSEs and LSEs that ultimately influence decision making in non-social domains. When making a decision that participants believed would directly affect the amount of money they would receive in a tuition rebate, HSEs under threat were more supportive of a risky investment than control participants and LSEs under threat were less supportive of this risky strategy than control participants. As I predicted, risky decision making under threat is not limited to hypothetical decisions made on behalf of others (as in Study 1), but extends to more impactful self-relevant decisions as well.

Studies 1 and 2 provide strong evidence that HSEs and LSEs enact divergent regulatory strategies to govern motivational conflict aroused by risk, not just in relationship contexts but in other domains as well. It also provides additional support for the assertion that self-esteem differences in self-regulation following risk stem from underlying shifts in approach motivation.

In accordance with approach/avoidance theorizing (see Elliot, 2006), approach motivation guides action toward the presence or absence of positive stimuli. As approach motivation increases, people should demonstrate an increased focus on rewards and less regard for potential risks. This pattern was observed in the present study. Though the manipulation check indicated that all participants accurately perceived the risks and rewards of both investment scenarios, global shifts in approach motivation in response to relationship threat likely altered HSEs' and LSEs' evaluations of these scenarios in ways that mirror findings observed in interpersonal risk regulation research. In these domain-specific investigations, threatened HSEs disregard risk and pursue connectedness goals that allow them to re-establish intimacy with their partners whereas threatened LSEs are more attuned to risk and pursue self-protective goals (Murray et al., 2006). The similarity between these findings and the results of the present study strongly suggest that interpersonal risk regulation is inherently linked to more expansive regulatory strategies that serve to balance risk with reward.

It should be noted that participants' decisions in this study, as well as in Study 1, represent a specific type of risky decision. Participants were asked to make judgments in situations where they stood to attain (or miss out on) potential rewards but had to take risks to do so. It is exactly these types of decisions that are affected by approach motivation. However, there are other types of risky decisions that center on the presence or absence of negative outcomes. For example, riding a motorcycle without a helmet is surely risky but unlikely to provide much reward. In this context, risk is derived from the probability of receiving a negative outcome, not from the potential for missing out on a positive outcome. While these types of risky decisions may be partially influenced by approach motivation, it is likely that avoidance motivation would have a greater impact on decision making in these situations. Avoidance motivation directs

action away from negative outcomes. Thus, in situations where negative outcomes are salient, such motivation should have a more pronounced influence on decision making. Although the current studies were designed to test for self-esteem differences in approach motivation, this possibility warrants future research to reveal how avoidance motivation and risk regulation processes are linked.

In Studies 1 and 2, I demonstrated that self-esteem moderates global regulatory responses to risk. Relationship-specific threat led to strengthened global approach goals among HSEs, and inhibited activation of global approach goals among LSEs. These regulatory responses influenced self-regulation outside of relationship contexts. In Studies 3-5, I sought to investigate the hypothesis that these regulatory shifts are contingent on having sufficient executive control. I theorized that regulating risk requires cognitive resources. When these resources are depleted, I expected that differences in the way that HSEs and LSEs respond to risk would be much less apparent.

### **Study 3: The Influence of Executive Control on Interpersonal Risk Regulation**

In Study 3, I explored the possibility that the influence of self-esteem on regulatory responses to risk is contingent on executive control. For both HSEs and LSEs alike, enacting their preferred regulatory response to risk requires them to exert self-control. To prioritize approach-directed goals and pursue rewards both in and out relationship contexts, HSEs must set aside concerns about risk. Offsetting a motivation to avoid negative outcomes requires them to willfully heighten their opposing motivation to pursue positive ones. Similar means are employed by LSEs to achieve different regulatory objectives. To guard themselves from the potential hazards that may arise from a risky situation, LSEs must counteract desires to obtain the rewards that those situations may offer. LSEs consciously inhibit motivation to pursue rewards and exhibit more cautious self-regulation when risk is salient. Though the outcomes of these regulatory strategies are different, the underlying process requires both HSEs and LSEs to employ conscious effort to pursue preferred goals and resist influence from motivationally oppositional ones (Murray et al., 2008). This hypothesis contrasts somewhat with traditional theorizing about self-esteem. That is, researchers have often conceptualized HSEs' and LSEs' behavior as habitual and relatively automatic (Baumeister, 1993). When self-esteem differences are observed, the dominant tendency is to view those differences as resulting from deep-seated beliefs that influence behavior relatively nonconsciously. I contend that conscious processing plays a larger role in shaping HSEs' and LSEs' goal-directed actions than previously assumed.

I tested this idea in the present study by examining cognitive responses to interpersonal risk under conditions of high and low executive control. Prior research has shown that one means by which people regulate interpersonal risk is by altering cognitive appraisals of their relationship. HSEs bolster relationship evaluations under risk, whereas LSEs derogate their

relationships (Murray et al., 2005). I examined how the inclination to shift relationship appraisals was affected when participants were placed under cognitive load. As in Study 1, I also examined general approach motivation and risky decision making.

I hypothesized that under low cognitive load, self-esteem would predict responses to threat as it did in Studies 1 and 2. That is, I predicted that LSEs would be less approach-oriented and less positive in their relationship evaluations than HSEs, replicating the typical risk regulation findings of prior research (Murray et al., 2006). However, I theorized that cognitive load would impair HSEs' and LSEs' ability to enact their preferred regulatory strategies and thus minimize the influence of self-esteem on regulatory responses. That is, I anticipated that LSEs would be as willing as HSEs to pursue positive outcomes and that they would not differ in their relationship appraisals.

## **Method**

**Participants.** Participants were 55 undergraduates (44 female, 11 male;  $M_{age} = 20.85$  years,  $SD = 1.62$ ) from the University of Waterloo who were currently in dating relationships ( $M_{length} = 27.53$  months,  $SD = 21.55$ ).

**Procedure.** Upon arrival at the laboratory, participants completed the same measure of self-esteem used in Studies 1 and 2 ( $\alpha = .84$ ) and as in Study 1, were instructed to read a passage from which they would be later asked to recall details. All participants were given the threatening version of the passage that claimed people tend to overestimate their quality of their romantic relationships. When participants had read the passage, the experimenter collected it and sat them at a computer that guided them through the remainder of the session.

Participants were randomly assigned to cognitive load condition. In the 'busy' condition, participants were asked to learn a 9-digit alphanumeric string and rehearse it for the duration of

the study. In the ‘not busy’ condition, this string contained only three digits (Gilbert & Hixon, 1991). Participants then completed measures of approach strength, risky decision making, and relationship quality. I ensured that that participants were rehearsing their alphanumeric string by prompting them to report it three times throughout the experimental session. To maintain the cover story and keep the threat manipulation salient, participants were asked to recall details from the passage at several points during the session. When participants had completed the study, they were debriefed and thanked for their participation.

### **Measures.**

*Approach strength.* Participants completed the same 9-item measure of approach motivation that was used in Study 1 ( $\alpha = .78$ ).

*Risky decision making.* To assess participants’ focus on positive outcomes, I presented them with two hypothetical scenarios similar to those used in Study 1, in which participants considered the extent to which they would endorse a risky but relatively rewarding course of action (e.g., accepting a high-paying job offer with uncertain job security) over a safer but less appealing alternative (e.g., a lower-paying but more secure offer). Likelihood of engaging in the risky alternative in each scenario was measured on a 1 (*not at all likely*) to 7 (*extremely likely*) scale. Reliability for these two items was not ideal ( $\alpha = .45$ ) but the pattern of responding was similar for both so I averaged across both items.

*Relationship quality.* To assess relationship quality, participants responded to a series of items on 7-point scales, with higher scores indicating more positive relationship evaluations. Three items ( $\alpha = .89$ ) adapted from Rusbult, Martz, and Agnew (1998) assessed participants’ satisfaction with their romantic relationship (e.g., “My relationship makes me very happy”). An additional three items ( $\alpha = .88$ ) assessed participants’ commitment to their romantic partners

(Rusbult et al., 1998). Participants' feelings of closeness to their partners were assessed with the 2-item ( $\alpha = .79$ ) Subjective Closeness Inventory (Berscheid, Snyder, & Omoto, 1989). As well, participants' optimism about the future of their romantic relationships was assessed with a 7-item scale in which they were asked to evaluate the likelihood that they and their partner would be together across a number of different time periods ranging from two months to a lifetime (MacDonald & Ross, 1999). These items were aggregated ( $\alpha = .94$ ) with higher scores indicating more optimistic predictions about relationship longevity.

## Results

To test my hypothesis that self-esteem would moderate responses to relationship threat when participants had full executive functioning, but would fail to do so when participants were cognitively busy, I first created composite measures of connectedness (satisfaction and closeness, each transformed to a z-score and averaged;  $\alpha = .51$ ) and relationship commitment (commitment and optimism, transformed to a z-score and averaged,  $\alpha = .88$ ). I submitted all dependent variables to a hierarchical regression analysis. The dummy coded main effect of cognitive load (0 = not busy, 1 = busy) and centered self-esteem scores were entered on the first step, while the two-way interaction was entered on the second step. Simple effects were calculated at one standard deviation above and below the mean and predicted values are reported in Table 3.

**Approach strength.** Examination of participants' approach strength revealed a marginal main effect of cognitive load,  $\beta = .23$ ,  $t(52) = 1.78$ ,  $p = .08$ , and a significant main effect of self-esteem,  $\beta = .28$ ,  $t(52) = 2.14$ ,  $p = .04$ . However, these effects were qualified by a marginally significant two-way interaction,  $\beta = -.37$ ,  $t(51) = -1.89$ ,  $p = .06$ . HSEs' self-reported approach motivation was relatively unaffected by the cognitive load manipulation,  $\beta = -.02$ ,  $t(51) = -.73$ ,  $p$

= .47. However, as predicted, LSEs reported significantly stronger approach motivation in the busy condition than in the not busy condition,  $\beta = .65$ ,  $t(51) = 2.54$ ,  $p = .01$ . Examination of the simple slopes revealed that as expected, HSEs reported significantly greater approach strength than LSEs in the not busy condition,  $\beta = .56$ ,  $t(51) = 2.86$ ,  $p = .01$ , replicating the effect seen in Study 1. However, this difference was eliminated in the busy condition,  $\beta = .08$ ,  $t(51) = .45$ ,  $p = .65$ .

**Risky decision making.** Analysis of participants' risk-taking scores revealed a similar pattern. There was neither a main effect of load,  $\beta = .06$ ,  $t(52) = .44$ ,  $p = .66$ , nor of self-esteem,  $\beta = .19$ ,  $t(52) = 1.41$ ,  $p = .17$ . As predicted, however, the two-way interaction was significant,  $\beta = -.52$ ,  $t(51) = -2.63$ ,  $p = .01$ . Examination of the simple effects revealed that as I hypothesized, HSEs in the not busy condition were riskier than HSEs in the busy condition,  $\beta = -.53$ ,  $t(51) = -2.05$ ,  $p = .046$ . In contrast, cognitive load made LSEs significantly less risky,  $\beta = .66$ ,  $t(51) = 2.52$ ,  $p = .02$ . When they had sufficient cognitive resources, HSEs reported significantly greater willingness to partake in the risky options than LSEs,  $\beta = .59$ ,  $t(51) = 2.97$ ,  $p = .01$ . However, as predicted, this self-esteem difference was not observed when participants were placed under cognitive load,  $\beta = -.10$ ,  $t(51) = -.57$ ,  $p = .57$ .

**Connectedness.** Examination of participants' relationship connectedness scores again revealed no main effect of load,  $\beta = .02$ ,  $t(52) = .13$ ,  $p = .90$ . A significant main effect of self-esteem emerged,  $\beta = .29$ ,  $t(52) = 2.14$ ,  $p = .04$ , though it was qualified by the hypothesized two-way interaction,  $\beta = -.50$ ,  $t(51) = -2.58$ ,  $p = .01$ . As predicted, HSEs in the not-busy condition reported greater connectedness to their partners relative to those in the busy condition,  $\beta = -.55$ ,  $t(51) = -2.16$ ,  $p = .04$ . Conversely, LSE participants who had full use of executive resources reported less connectedness relative to those who were under cognitive load,  $\beta = .59$ ,  $t(51) =$



2.31,  $p = .03$ . Examination of simple slopes revealed that HSEs reported greater connectedness than LSEs in the not busy condition,  $\beta = .67$ ,  $t(51) = 3.43$ ,  $p = .001$ . As hypothesized, however, there were no such differences in the busy condition,  $\beta = .01$ ,  $t(51) = .06$ ,  $p = .95$ .

**Commitment.** The regression analysis predicting participants' commitment to their relationships revealed a similar pattern of results. There was no main effect of cognitive load,  $\beta = .01$ ,  $t(52) = .05$ ,  $p = .96$ , and a marginally significant main effect of self-esteem,  $\beta = .25$ ,  $t(52) = 1.87$ ,  $p = .07$ . However, this was qualified by the predicted two-way interaction,  $\beta = -.48$ ,  $t(51) = -2.41$ ,  $p = .02$ . Again, HSEs who were busy were less committed than HSEs who were not,  $\beta = -.53$ ,  $t(51) = -2.06$ ,  $p = .045$ , whereas LSEs who were cognitively busy were *more* committed than LSEs who were not,  $\beta = .55$ ,  $t(51) = 2.12$ ,  $p = .04$ . In the not busy condition, HSEs reported greater commitment than did LSEs,  $\beta = .62$ ,  $t(51) = 3.10$ ,  $p = .003$ . Again, however, self-esteem did not predict commitment in the busy condition,  $\beta = -.01$ ,  $t(51) = -.07$ ,  $p = .95$ .

Table 3  
*Predicted Scores for the Condition X Self-Esteem Interactions in Study 3*

Dependent measure	Low self-esteem		High self-esteem	
	Not busy	Busy	Not busy	Busy
Approach strength	6.65	7.63	7.81	7.79
Risky decision making	4.86	5.68	6.06	5.49
Connectedness	-.59	-.01	.51	.01
Commitment	-.61	-.001	.55	-.02

*Note.* Low and high self-esteem refer to participants one standard deviation above and below the mean, respectively.

## **Discussion**

The results of Study 3 provide the first demonstration that HSEs' and LSEs' differential regulatory responses to risk require executive control. When they had full executive control, HSEs sought to fend off relationship threat by heightening global approach motivation. They made riskier decisions and their bolstered relationship evaluations reflected a focus on pursuing relationship-connectedness goals. In contrast, LSEs responded to relationship threat by inhibiting general approach motivation, making less risky decisions, and downplaying relationship evaluations. This latter finding reflects pursuit of self-protection goals (Murray et al., 2002). However, the influence of self-esteem was completely attenuated by cognitive load. HSEs and LSEs reported similar approach motivation and similar relationship evaluations when they were cognitively busy, suggesting that their usual responses were disrupted by cognitive busyness.

The results of the present study challenge the way that self-esteem is traditionally represented in the literature. Many empirical observations of behavioral differences between HSEs and LSEs have tacitly assumed that such differences arise relatively automatically from ingrained beliefs about self-worth. LSEs in particular, exhibit many potentially destructive behaviors that have often been characterized as habitual responses (e.g., Blaine & Crocker, 1993; Sommer & Baumeister, 2002). However, such actions may be produced by self-regulatory processes that are more controlled than previously realized. HSEs and LSEs may be equally capable of responding similarly to risk, but usually implement different regulatory strategies that lead to divergent outcomes. Because my claim that executive control is a critical component in determining HSEs' and LSEs' responses to risk runs counter to conventional thinking about the nature of self-esteem differences, I felt that it was important to demonstrate the findings of Study 3 were robust by replicating them in Study 4.

One limitation of Study 3 was that it lacked a no-threat comparison group. All participants in this study were placed under relationship threat and as a result, the findings are subject to alternative interpretations. For example, it may be that cognitive load impaired participants' ability to properly comprehend and complete the dependent measures. Self-esteem's lack of influence in the busy condition may not have resulted from a disruption of regulatory processes, but instead from this methodological artifact. To rectify this issue and provide more conclusive support for my assertion that taxing executive function precludes the conscious application of procedural rules that regulate responses to risk, I sought to replicate these findings in the following study.

#### **Study 4: Clarifying the Role of Executive Control**

In Study 4, I attempted to reproduce the findings of Study 3 while clarifying problems of interpretation. To do so, I employed a similar design to the previous study but added a control group in which participants were not threatened to rule out the possibility that burdening executive function would affect relationship appraisals even when risk was absent. In this study, I focused exclusively on participants' relationship-specific evaluations. Examining how these dependent measures varied as a function of my experimental manipulations in Study 3 provided a relatively conservative test of my hypothesis. Constructs such as relationship satisfaction and commitment are seldom examined in experimental designs due to their stability (cf. Finkel, Rusbult, Kumashiro, & Hannon, 2002). That I was able to shift these evaluations indicates not only the strength of regulatory responses to risk but also but also highlights the importance of executive control in facilitating these responses. Replicating this pattern of results in Study 4 would provide additional support for my hypothesis that cognitive resources are required for HSEs and LSEs to regulate risk.

I predicted that under relationship threat, HSEs and LSEs would respond as they did in Study 3. That is, I expected LSEs to make more negative relationship evaluations when not under load than when they were cognitively busy and I expected HSEs to report greater connectedness and commitment when they had full use of executive resources. However, when participants' relationships were not threatened, I expected to observe small or no differences between HSEs and LSEs regardless of cognitive load. Similar to Studies 1 and 2, tension between approach and avoidance-directed goals is not readily apparent when interpersonal risk is not salient (Murray et al., 2006). In the absence of the need to regulate responses, I expected that neither self-esteem nor cognitive load would influence participants' relationship evaluations.

## Method

**Participants.** One hundred and twenty-one undergraduates (90 female, 31 male;  $M_{age} = 20.13$  years,  $SD = 1.83$ ) from the University of Waterloo who were currently in dating relationships ( $M_{length} = 22.32$  months,  $SD = 16.54$ ) participated in exchange for course credit.

**Procedure.** The procedure was similar to that used in Study 3. After completing the Rosenberg (1965) self-esteem scale ( $\alpha = .73$ ), participants were presented with a written passage and instructed to read it carefully. Participants were randomly assigned to threat and no-threat conditions and were given the same passages used in Study 1. When they had finished reading it, the experimenter directed them to a computer that guided them through the remainder of the session. Again, participants who were assigned to the cognitively busy condition were instructed to learn and rehearse a 9-digit alphanumeric string, whereas those assigned to the not-busy condition were told to rehearse a 3-digit string. Following this, participants completed the same measures of relationship satisfaction ( $\alpha = .90$ ), commitment ( $\alpha = .78$ ), closeness ( $\alpha = .71$ ), and optimism ( $\alpha = .93$ ) as in Study 3. Additionally, participants completed a 5-item measure ( $\alpha = .70$ ) of perceived regard. This measure captured participants' beliefs about their partners' regard and continued responsiveness (e.g., "I am confident that my partner accepts and loves me") and they responded to each item on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). To ensure that participants had attended to the written passage and to the cognitive load instructions, they were asked to recall the alphanumeric string and details about the passage three times throughout the session. When participants had completed the study, they were debriefed and thanked for their participation.

## Results

To test my hypothesis that self-esteem would moderate the influence of relationship threat on relationship evaluations when participants had full executive functioning, but would fail to do so when participants were cognitively busy, I again created composite measures of connectedness (satisfaction and closeness, each transformed to a z-score and averaged;  $\alpha = .69$ ) and relationship commitment (commitment and optimism, transformed to a z-score and averaged,  $\alpha = .72$ ). Following this, the dependent measures were submitted to hierarchical regression analyses in which the dummy coded main effects of threat (0 = no threat, 1 = threat) and cognitive load (0 = not busy, 1 = busy), as well as centered self-esteem scores were entered on the first step. All two-way interactions were entered on the second step, while the three-way interaction was entered on the final step. Simple effects were calculated at one standard deviation above and below the mean. For clarity, regression coefficients are presented in Table 4 and I discuss only the simple slopes and simple effects involving the hypothesized interaction below. Predicted values are reported in Table 5.

**Connectedness.** As anticipated, a significant three-way interaction predicted participants' relationship connectedness (see Figure 2). In the no threat condition, the two-way interaction between cognitive load and self-esteem was not significant, nor were any of the simple effects, all  $ps > .78$ . As predicted, however, cognitive load impacted HSEs' and LSEs' connectedness ratings differentially when participants were exposed to relationship threat. Decomposing the strongly significant two-way interaction ( $\beta = -.66$ ,  $t(113) = -4.19$ ,  $p < .001$ ) revealed that similar to Study 3, HSEs in the not busy condition reported greater connectedness than did HSEs in the busy condition,  $\beta = -.31$ ,  $t(113) = -2.02$ ,  $p = .046$ . In contrast and as hypothesized, LSEs under low cognitive load reported *less* connectedness than LSEs whose use of executive resources was

impaired,  $\beta = .63$ ,  $t(113) = 3.87$ ,  $p < .001$ . HSEs reported significantly greater connectedness than LSEs in the no load condition,  $\beta = .93$ ,  $t(113) = 6.84$ ,  $p < .001$ . However, self-esteem was not associated with connectedness when participants were placed under cognitive load,  $\beta = -.01$ ,  $t(113) = -.04$ ,  $p = .97$ .

**Commitment.** The regression analysis predicting participants' relationship commitment also revealed a significant three-way interaction. In the absence of relationship threat, the load by self-esteem interaction was not significant nor were any of the simple effects, all  $ps > .10$ . As in Study 3, however, this interaction was significant in the relationship threat condition,  $\beta = -.66$ ,  $t(113) = -4.31$ ,  $p = .001$ . As I anticipated, cognitive load tempered HSEs' reports of relationship commitment,  $\beta = -.36$ ,  $t(113) = -2.40$ ,  $p = .02$ . For LSEs, however, those in the busy condition reported greater commitment than did those in the not-busy condition,  $\beta = .58$ ,  $t(113) = 3.70$ ,  $p < .001$ . Investigation of the simple slopes indicated that HSEs reported greater commitment than LSEs when in the not busy condition,  $\beta = 1.01$ ,  $t(113) = 7.61$ ,  $p < .001$ , but as expected, HSEs and LSEs did not differ in the busy condition,  $\beta = .07$ ,  $t(113) = .40$ ,  $p = .69$ .

**Perceived regard.** A similar pattern of results emerged for participants' perceptions of their partner's regard. The three-way interaction was again significant. In the no threat condition, neither the two-way interaction between cognitive load and self-esteem nor any simple effects were significant, all  $ps > .12$ . However, in the threat condition, a significant interaction did emerge,  $\beta = -.68$ ,  $t(113) = -4.50$ ,  $p < .001$ . As I expected, HSEs in the not-busy condition reported higher perceived regard than HSEs in the busy condition,  $\beta = -.40$ ,  $t(113) = -2.71$ ,  $p = .01$ . However, the reverse was true for LSE participants. LSEs in the not busy condition believed their partners regarded them less positively than LSEs in the busy condition,  $\beta = .58$ ,  $t(113) = -3.64$ ,  $p < .001$ . HSEs were more confident in their partner's regard than LSEs were when they

were not under cognitive load,  $\beta = 1.00$ ,  $t(113) = 7.61$ ,  $p < .001$ . However, this effect did not emerge when participants were in the busy condition,  $\beta = .03$ ,  $t(113) = .16$ ,  $p = .87$ .

Figure 2. Relationship connectedness as a function of condition and self-esteem in Study 4.





Table 4  
*Summary of Regression Analyses in Study 4*

Dependent measure	Cognitive load condition (Not busy vs. Busy) <sup>a</sup>		Relationship threat condition (No threat vs. Threat) <sup>a</sup>		Self-esteem <sup>a</sup>		Cognitive load X Relationship threat <sup>b</sup>		Cognitive load X Self-esteem <sup>b</sup>		Relationship threat X Self-esteem <sup>b</sup>		Cognitive load X Relationship threat X Self-esteem <sup>c</sup>	
	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$
Connectedness	.01	.16	.03	.33	.40	4.71**	.26	1.92 <sup>†</sup>	-.37	-3.16**	.21	1.76 <sup>†</sup>	-.38	-2.68**
Commitment	.02	.22	-.05	-.64	.42	5.03**	.18	1.37	-.42	-3.78**	.27	2.33*	-.31	-2.23*
Perceived regard	-.02	-.22	-.02	-.28	.43	5.18**	.19	1.43	-.41	-3.61**	.23	2.03*	-.36	-2.65**

<sup>a</sup> Error terms are based on 117 degrees of freedom. <sup>b</sup> Error terms are based on 114 degrees of freedom. <sup>c</sup> Error terms are based on 113 degrees of freedom.

\*  $p \leq .01$     \*\*  $p \leq .05$     <sup>†</sup>  $p \leq .10$

Table 5  
*Predicted Scores for High and Low Self-Esteem Participants in Each Condition in Study 4*

Dependent measure	Low self-esteem				High self-esteem			
	No threat / Not busy	No threat / Busy	Threat / Not busy	Threat / Busy	No threat / Not busy	No threat / Busy	Threat / Not busy	Threat / Busy
Connectedness	-.09	-.30	-.88	.22	.28	-.06	.74	.20
Commitment	-.14	-.12	-1.00	.03	.37	-.03	.78	.15
Perceived regard	6.13	6.02	5.45	6.27	6.51	6.20	6.89	6.31

*Note.* Low and high self-esteem refer to participants one standard deviation above and below the mean, respectively.

## **Discussion**

The results of Study 4 replicated those of Study 3 and provided further support for my hypothesis. When interpersonal risk was made salient by a relationship threat, cognitive load moderated the influence of self-esteem on participants' responses. When not cognitively busy, HSEs and LSEs diverged drastically in their ratings of connectedness, commitment, and perceived regard. However, such differences were eliminated when participants were under load. In comparison to HSEs who were cognitively busy, HSEs who were not busy exhibited greater positivity, suggesting that they actively bolstered relationship evaluations to compensate for feelings of vulnerability. In contrast, LSEs seemed to devalue their relationships when they were not cognitively taxed in comparison to LSEs under load. This active derogation of their relationships is indicative of a self-protective response commonly observed in risk regulation research. Notably, such a pattern did not emerge when participants were not under relationship threat. HSEs and LSEs made equally positive relationship evaluations regardless of cognitive load when interpersonal risk was absent. Cognitive busyness did not seem to impair responses to the dependent measures uniformly when risk was not salient and thus the impact of cognitive load in the threat condition can be attributed to the hypothesized disruption of risk regulation processes.

Taken together, the results of Studies 3 and 4 indicate that executive control plays a critical role in governing how self-esteem influences responses to risky situations and this has important implications for understanding interpersonal risk regulation processes. When under cognitive load, both HSEs' and LSEs' responses to threat were indistinguishable from those of participants who were not under threat, providing the strongest evidence thus far that risk regulation is an executive-based system. These findings imply that for HSEs, executive control

functions adaptively. It serves to prioritize approach-directed connectedness goals and protect interpersonal relationships from threat through compensatory, positive beliefs about the relationship. When executive control is impaired, this constructive process is attenuated. For LSEs, however, it appears that the executive control system may interfere with their relationship outcomes by operating in a maladaptive way. Disrupting executive processing revealed that LSEs feel as committed and as satisfied as HSEs, perhaps until their thoughts warn them of the dangers of being attached. Because LSEs generally have more unwarranted insecurities and likely experience motivational conflict more regularly than HSEs (Murray et al., 2001), it is likely that the operation of the executive control system plays a central role in undermining LSEs' relationship outcomes (see also Murray et al., 2008, 2009). I discuss the implications of this finding further in the General Discussion.

Together, the four studies described thus far suggest that interpersonal risk engages a regulatory system that governs approach and avoidance behavior in other domains and that self-esteem plays a critical role in the functioning of this system. Moreover, they indicate that the differential responses of HSEs and LSEs do not function automatically, but instead require executive control. In the previous studies, I have investigated how relationship-specific risks elicit self-esteem differences in regulatory responses. However, I want to argue that these regulatory processes can be activated by non-relational risks as well. The broad nature of HSE and LSEs' regulatory responses to domain-specific risk suggests that such strategies may also be used to regulate risk outside of interpersonal contexts. I tested this idea in Study 5 by examining risky social comparison processes after a threat to academic competence.

### **Study 5: Examining Responses to Non-interpersonal Risk**

While self-esteem plays a critical role in responses to interpersonal risk, prior research has demonstrated that similar regulatory strategies are adopted to regulate risk in other domains. That is, when situational contexts offer opportunities for reward that are coupled with risk, HSEs tend to set aside risk in pursuit of positive outcomes, whereas LSEs forgo potential rewards and protect themselves from negative outcomes. Support for this is seen most prominently in research examining how self-esteem influences social comparison processes following a failure experience. When people experience a personal failure, comparing one's own performance to others is inherently risky. On the one hand, such comparisons might serve a beneficial evaluative function. They might allow people to assess why they failed and thereby suggest means of improvement (Festinger, 1954; Gibbons & Buunk, 1999; Taylor & Lobel, 1989). However, to do this effectively people must often make upward comparisons. Comparing oneself to superior others is perilous because it often highlights one's shortcomings and has a detrimental impact on mood and self-worth (Brickman & Bulman, 1977; Tesser, Millar, & Moore, 1988).<sup>1</sup> When presented with such a conflict, HSEs and LSEs show differential preference for risky social comparison information that I believe corresponds to their responses to interpersonal risk observed in Studies 1-4.

When HSEs fail, they show a greater willingness to make social comparisons than do LSEs (Wood, Giordano-Beech, Taylor, Michela, & Gaus, 1994). LSEs exhibit contrasting self-protective tendencies following failure and this motivation to avoid unflattering comparisons often leads them to forego the potential rewards of doing so (Baumeister, Tice, & Hutton, 1989;

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<sup>1</sup> It should be noted here that making downward comparisons may boost self-worth and mood (Wills, 1991). However, in many contexts such comparisons would be of limited value when pursuing self-improvement goals. Comparing oneself to an inferior other is unlikely to generate useful insight into how people can improve on a given task.

cf. Wood & Lockwood, 1999). Though HSEs also exhibit self-protective tendencies when comparing themselves to others following failure (e.g., Wood, Giordano-Beech, & Ducharme, 1999) they still show greater inclination to set these concerns aside when such information will be beneficial (Wood et al., 1994). I hypothesized that these differences in social comparison following threat also result from executive-based regulatory processes that govern broader approach and avoidance conflicts that are similar to those observed in the previous studies. That is, when people are presented with conflict between the goal to protect one's self-esteem and the goal to collect diagnostic information that fosters improvement, I theorize that HSEs actively set aside risks and pursue potential rewards. In contrast, LSEs consciously relinquish opportunities for improvement and instead pursue goals that will guard them from risk. Because these regulatory strategies require executive control to undertake, I expected them to be disrupted when cognitive resources were depleted.

In Study 5, I tested this hypothesis by having participants complete a test that ostensibly assessed a skill that was central to academic success. This test also served as a manipulation of executive control. In place of the cognitive busyness manipulation, the task instructions required participants to engage in an easy or difficult act of self-control. Such acts require exertion of executive strength and thereby deplete cognitive resources available for subsequent tasks (Muraven & Baumeister, 2000). Following this, I presented half of the participants with (false) negative feedback about their performance and gave them the opportunity to compare themselves with others in order to learn from their experiences and improve on a subsequent evaluation. I predicted that HSEs and LSEs would differ in their willingness to make social comparisons following failure only when the test did not deplete executive function. That is, I predicted that following failure, HSEs would be more likely to compare themselves to others relative to control

participants whereas LSEs would be less willing to engage in these risky comparisons. However, when participants' resources were depleted, I expected to observe no such differences.

## **Method**

**Participants.** One hundred and forty-eight undergraduate participants (101 female, 47 male;  $M_{age} = 20.08$ ,  $SD = 1.57$ ) participated in the study in exchange for course credit.

**Procedure.** Participants who volunteered for an online study on “Cognitive Performance” were sent a web link that directed them to an online study. After first completing the Rosenberg (1965) self-esteem scale ( $\alpha = .92$ ), participants were presented with task that ostensibly measured ‘verbal integration’. In the introductory text (adapted from Di Paula & Campbell, 2002), participants were told that this construct was highly important for university students. They read that “Those who score highly on the test tend to have higher averages, are more likely to be successful in admission to graduate school and in the job market, and are generally successful in academic and career endeavors.” Participants were informed that they would have five minutes to write a short story and that their writing sample would be immediately transmitted to a secure database and scored electronically on several metrics. They were told that these metrics would then be standardized and presented to them as a score ranging from 0 to 100, with higher scores indicating greater verbal integration ability. After reading these instructions, participants proceeded to this task, which actually served as the manipulation of resource depletion.

Participants in both conditions were given six minutes to write a story about a recent trip they had taken. They were told that the story may be fictional or based on true events, but must be written in the first-person perspective. In the depletion condition, participants were instructed not to use the letters ‘a’ or ‘n’ anywhere in their story. This restriction required participants in

this condition to regulate their writing, thereby consuming their executive resources. In the no-depletion condition, participants were instructed not to use the letters ‘q’ or ‘z’ in their story, a task that required less self-regulation and thus was less taxing on their executive ability (Schmeichel, 2007; Schmeichel & Vohs, 2009).

After this writing task, participants were presented with their verbal integration feedback that was ostensibly derived from an electronic analysis of their writing. In the failure-feedback condition, participants were presented with a score of 55 out of a possible 100 points and were told this score reflected ‘poor’ performance on the integration task. Those in the no-feedback condition were told that their score had been successfully computed but would not be presented due to a computer error on the remote server. As a manipulation check, participants were asked to indicate on a 1 (*very poor*) to 7 (*excellent*) scale how well they thought they did on the verbal integration task.

After viewing this feedback, participants were informed that they would be able to take another verbal integration test later in the session. They were told that to assist them in the subsequent task, they would be given the opportunity to view ‘strategies’ for completing the task that were provided by prior participants. Participants read that the researchers had identified four specific participants whose feedback would be particularly useful. These four ‘prior participants’ served as targets of social comparison.

Before viewing the strategies that the targets ostensibly wrote, participants were presented with the overall score that each person received on the verbal integration task as well as some purposefully vague information about how this person’s strategy might foster improvement on the task. Of these four potential comparison targets, two of them were presented as having high scores (i.e., 85 and 88 out of 100), thereby providing an upward comparison for

participants. Two were presented as having relatively low scores (i.e., 27 and 32 out of 100) and represented downward comparison targets.

After participants viewed this summary information, they were shown each target's 'strategies' individually in a counterbalanced order. Each of the four pages displayed the target's verbal integration score followed by a short paragraph describing their advice for improvement. The strategies were of roughly equal length for each target and were intentionally broad so as not to be of much genuine utility for participants. For example, one of the upward targets suggested that participants 'watch the timer to make sure you don't run out of time' and one of the downward targets suggested that participants 'pay close attention to the instructions' so that they did not inadvertently use the prohibited letters. Instructions atop each page informed participants they could skip over any strategies they were not interested in seeing. The computer recorded the amount of time (in seconds) that participants spent viewing each strategy and this served as my behavioral dependent measure of social comparison. I theorized that devoting time to reading and interpreting each strategy would reflect a desire to compare oneself to these targets in order to improve their verbal integration ability (for similar logic see Butler, 1992).

Finally, participants were asked to complete the verbal integration task again, this time writing about a value that was important to them and having no restrictions placed on the letters they were able to use. This task served to not only maintain the cover story, but also as a self-affirmation task that would offset any negative effects stemming from my earlier feedback manipulation or from resource depletion (Fein & Spencer, 1997; Schmeichel & Vohs, 2009). Participants were then thanked and fully debriefed.



## Results

To test my hypothesis that high and low self-esteem would differ in their desire to socially compare after failure feedback, but not after neutral feedback, and that these differences would be eliminated by resource depletion, I used a data analysis strategy similar to that employed in Study 4. The dependent measures were regressed onto the dummy coded main effects of test feedback (0 = neutral feedback, 1 = failure feedback), resource depletion (0 = not depleted, 1 = depleted), and centered self-esteem scores on the first step of a hierarchical regression analysis. All two-way interactions were entered on the second step and the three-way interaction was entered on the third step. Again, all simple effects were calculated at one standard deviation above and below the mean of participants' self-esteem scores.

**Manipulation check.** Analysis of participants' perceived performance on the verbal integration task revealed that the manipulations were effective. Results revealed a main effect of feedback such that as intended, participants in the failure feedback condition ( $M = 3.28$ ) believed they performed more poorly than did those in neutral feedback condition ( $M = 4.00$ ),  $\beta = -.19$ ,  $t(144) = -2.60$ ,  $p = .01$ . There was also a main effect of depletion such that those in the depletion condition ( $M = 2.98$ ) believed they performed more poorly than did those in the no-depletion condition ( $M = 4.30$ ),  $\beta = -.35$ ,  $t(144) = -4.70$ ,  $p < .001$ . This is indicative of the greater difficulty of the depleting task that required more response inhibition. Finally, there was a main effect of self-esteem,  $\beta = .15$ ,  $t(144) = 1.96$ ,  $p = .05$ , indicating that HSE participants were more assured of their verbal integration ability than were LSEs. Importantly, however, there were no significant interactions between these variables, all  $ps > .60$ . This suggests that despite the overall difference between HSEs' and LSEs' perceptions of their own performance, self-esteem did not moderate the effectiveness of the experimental manipulations.

**Social comparison.** Analysis of the mean time participants spent viewing each target revealed that participants generally spent more time examining the strategies of the upward comparison targets ( $M = 37.61$ ,  $SD = 21.38$ ) than they did analyzing the strategies of downward comparison targets ( $M = 27.53$ ,  $SD = 48.32$ ),  $F(1,147) = 5.89$ ,  $p = .02$ . However, these differences were not affected by either of the experimental manipulations nor by self-esteem, all  $ps > .10$  and thus, I collapsed across all targets.

The coefficients for the full regression model are presented in Table 6 and only the relevant simple effects are discussed here. The predicted values from this analysis are displayed in Table 7. As in Study 4, the hypothesized three-way interaction was significant. As predicted and as displayed in Figure 3, resource depletion interacted with self-esteem among participants in the failure condition,  $\beta = -.52$ ,  $t(140) = -3.23$ ,  $p = .001$ . HSEs who were cognitively depleted spent less time viewing the comparison targets than did HSEs who were not depleted,  $\beta = -.42$ ,  $t(140) = -2.63$ ,  $p = .01$ . The reverse was true for LSEs. LSEs who were depleted spent significantly *more* time looking at the targets than did non-depleted LSEs,  $\beta = .30$ ,  $t(140) = 1.99$ ,  $p = .049$ . Examination of the simple slopes revealed that when participants were not depleted, HSEs viewed the comparison targets significantly longer than LSEs did,  $\beta = .65$ ,  $t(140) = 4.16$ ,  $p < .001$ . However, self-esteem was not related to the time spent on social comparison in the depletion condition,  $\beta = -.04$ ,  $t(140) = -.23$ ,  $p = .82$ . As I expected, this interaction was not significant among participants who received neutral feedback about their performance on the verbal integration task, nor were any of the simple effects, all  $ps > .53$ .

Table 6  
*Summary of Regression Analysis in Study 5*

	Feedback condition (Neutral vs. Failure) <sup>a</sup>		Resource depletion condition (Not depleted vs. depleted) <sup>a</sup>		Self-esteem <sup>a</sup>		Feedback X Resource depletion <sup>b</sup>		Feedback X Self-esteem <sup>b</sup>		Resource depletion X Self-esteem <sup>b</sup>		Feedback X Resource depletion X Self-esteem <sup>c</sup>	
	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$
Time spent on social comparison	0.08	0.95	-0.06	-0.67	0.12	1.46	0.01	0.08	0.25	2.10*	-0.29	-2.47*	-0.35	-2.12*

<sup>a</sup> Error terms are based on 144 degrees of freedom. <sup>b</sup> Error terms are based on 141 degrees of freedom. <sup>c</sup> Error terms are based on 140 degrees of freedom.

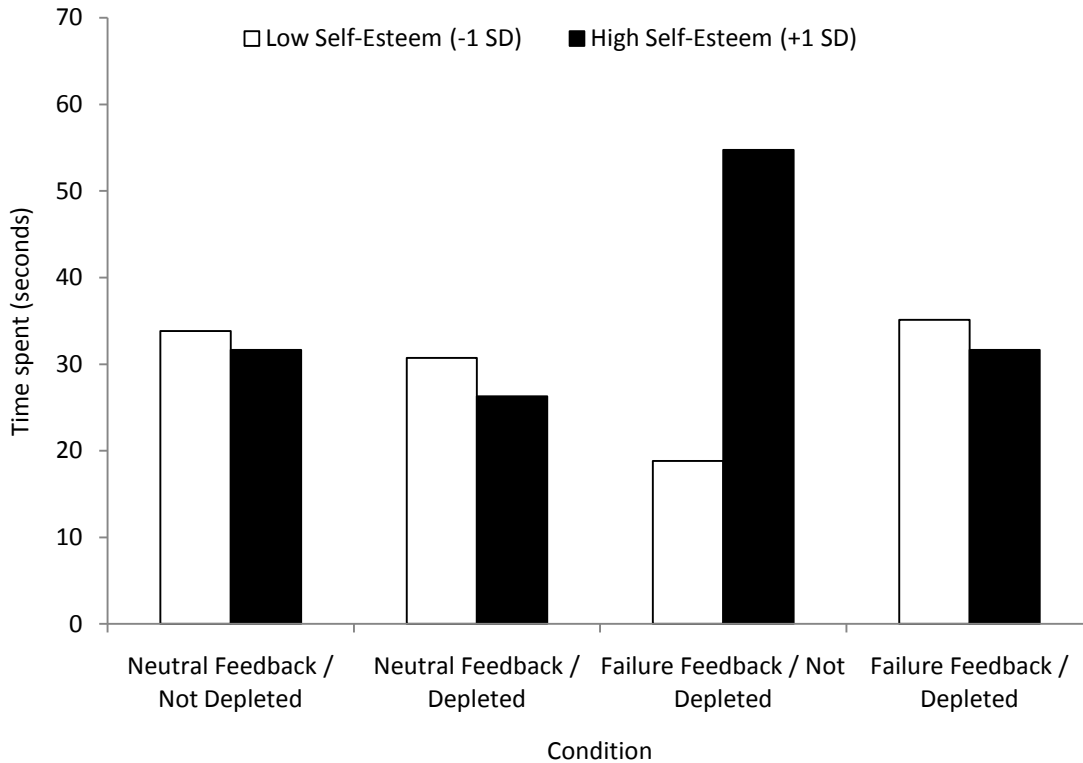
\*  $p \leq .01$     \*\*  $p \leq .05$     †  $p \leq .10$

Table 7  
*Predicted Scores for High and Low Self-Esteem Participants in Each Condition in Study 5*

Dependent measure	Low self-esteem				High self-esteem			
	Neutral feedback/Not depleted	Neutral feedback/Depleted	Failure feedback/Not depleted	Failure feedback/Depleted	Neutral feedback/Not depleted	Neutral feedback/Depleted	Failure feedback/Not depleted	Failure feedback/Depleted
Time spent on social comparison	33.83	30.72	18.83	35.11	31.66	26.27	54.73	31.65

*Note.* Low and high self-esteem refer to participants one standard deviation above and below the mean, respectively.

Figure 3. Time spent on social comparison as a function of condition and self-esteem in Study 5.



## Discussion

The results of Study 5 provided additional support for my hypothesis that executive control is a critical determinant of the influence of self-esteem on regulatory responses to risk. When participants believed they had performed poorly on a task assessing an important self-construct, self-esteem moderated risky social comparison only when cognitive resources were not depleted. When executive resources were high, HSE participants responded to failure by spending more time examining social comparison targets than LSEs. This difference did not emerge when executive resources were diminished. Depleted HSEs spent less time viewing the targets than non-depleted HSEs, whereas depleted LSEs spent relatively *more* time than non-depleted LSEs.

This pattern of results is similar to that obtained in Study 4 and provides evidence that self-esteem governs risk management not only in interpersonal domains but in non-relational

domains as well. As in the previous studies, HSEs and LSEs differed in their willingness to pursue rewards when those rewards were paired with risk. Following a threatening failure experience, participants were given the opportunity to risk viewing social comparison information that might exacerbate the negativity of that experience in order to glean insight that may have improved subsequent performance. HSE participants prioritized and pursued self-improvement goals only when they had ample executive resources, suggesting again that their constructive responses to risk are controlled. In contrast, LSEs in the failure-feedback condition prioritized and pursued self-protection goals by spending little time on social comparison, but only when not depleted. Their inclination to avoid potentially damaging comparisons and relinquish opportunities for self-improvement was counteracted by the resource-depletion manipulation. This again suggests that LSEs' potentially destructive regulatory responses to risk result from conscious overturning of initial goal inclinations. Together, these data indicate that self-esteem's influence on self-regulation in the face of risk is contingent on executive resources and thus, these processes are more controlled than previously theorized. Interestingly, self-esteem played little role in influencing social comparison when risk was not present, that is, when participants did not receive feedback about their initial scores. The absence of regulatory conflict seems to negate self-esteem's role in determining self-regulation regardless of people's executive strength.

It should be noted that while I have suggested that HSEs' heightened social comparison following failure was driven by self-improvement goals, these results are open to an alternative motivational interpretation. Prior research (Wood et al., 1994, 1999) has demonstrated that HSEs are motivated to compare themselves with superior others in the face of threat in hopes of finding ways of compensating for earlier failure. Indeed, Wood, Giordano-Beech, and Ducharme (1999)

argued that such compensatory goals supersede self-improvement goals when HSEs make post-failure social comparisons. It is possible that HSEs spent more time viewing social comparison information not because they sought to improve their performance but instead because they wanted to find ways to discredit or derogate the targets?

Though such an explanation is possible, I argue that a self-improvement explanation is more plausible due to the heightened importance of this motive within this specific study. The present methodology emphasized the significance of the 'verbal integration' construct and stressed its impact in determining future outcomes. Accordingly, participants likely placed greater priority on improvement goals than they may otherwise have. Recall that there was no self-esteem difference in preference for upward and downward comparison targets and that like HSEs, LSEs preferred to view upward targets. This finding contrasts with work suggesting that LSEs are more self-protective than HSEs and thus should show a greater preference for downward comparison targets to offset the negative failure experience (Wood, 1989). That they did not suggest that self-improvement goals were active for all participants, though this motivation was tempered among LSEs by their general aversion to social comparison. As well, HSEs usually attempt to compensate for failure by finding other dimensions in which they compare favorably to superior others. The present study did not afford this opportunity as readily as did the methods employed by Wood et al. (1994, 1999). Thus, it is likely that HSEs were more motivated to glean information from the social comparisons in order to improve their performance on the second task than they were to compensate for an earlier failure experience.

While I argue that this explanation better suits the data of the present study, the idea that HSEs compensate for failure by deliberately comparing themselves to superior others is consistent with my hypothesis. As Wood et al. (1999) note, such efforts also entail substantial

risk. While HSEs may succeed in finding other aspects of the self or other dimensions in which they compare favorably to their target, they may also be unsuccessful and thereby exacerbate an already negative experience. Approaching the positive rewards inherent in compensatory social comparison requires HSEs to set aside risk and as such, likely results from the same executive-based regulatory processes that I propose underlie the current findings.

## General Discussion

Self-esteem plays a critical role in determining how people respond to interpersonal risk. HSEs enact connectedness goals in the face of threat, drawing their partners closer to alleviate feelings of vulnerability. LSEs, in contrast, enact self-protection goals by distancing themselves from their partners to minimize the impact of expected rejection. The present research demonstrated that such regulatory responses not only reflect broader motivational shifts but also that divergence in risk regulation among HSEs and LSEs is driven by executive control. Studies 1 and 2 showed that when interpersonal risk was salient, HSEs exhibited bolstered approach motivation and were more willing to make risky decisions in pursuit of potential rewards. LSEs responded to relationship threat with inhibited approach motivation and more conservative decision making. In Studies 3 and 4, I demonstrated that the differential responses to interpersonal risk among HSEs and LSEs were attenuated when executive control was impaired. HSEs and LSEs responded similarly when under cognitive load, with HSEs becoming more cautious and LSEs becoming less averse to risk relative to no-load participants. Indeed, those who were cognitively busy responded identically to those who were not faced with interpersonal risk. A similar effect occurred in Study 5, which demonstrated that executive control moderated the influence of self-esteem on willingness to engage in social comparison following a failure experience. HSEs were more willing than LSEs to risk the potentially distressing consequences of social comparison following failure, but only when their executive resources had not been depleted by an earlier act of self-control. Taken together, these results not only enhance understanding of interpersonal risk regulation, but also inform knowledge of self-regulation generally by highlighting the importance of self-esteem to goal pursuit.



## Potential Mechanisms of the Effect

Though the present studies demonstrate that HSEs and LSEs utilize executive control to enact divergent regulatory responses to risk, they do not allow a conclusive interpretation of *why* they do so. Exhibiting caution in the face of risk – as LSEs do – is a regulatory strategy that may be functional in many situations. HSEs, however, engage in somewhat counterintuitive self-regulation when risk is salient. Why do HSEs seemingly become bolder when it is least prudent to do so? I have suggested throughout that this response is driven by HSEs' desire to compensate for feelings of threat or risk by overriding competing motivations. That is, when anxiety is aroused by feelings of risk, HSEs alleviate negative thoughts by engaging in compensatory strategies. Such attempts to ward off apprehensions by approaching rewards more vigorously may lead HSEs to 'overshoot' and result in stronger approach goals under risk relative to baseline conditions.

Another possibility is that HSEs' and LSEs' controlled regulatory responses are driven by attempts to resolve goal tension in ways that are consistent with chronic goal orientations. Relative to LSEs, HSEs have been shown to be more chronically approach-oriented than avoidance-oriented (Heimpel et al., 2006). When situational risk presents the possibility of either approach or avoidance, executive strength may allow people to generate cognitive support for goals that are chronically accessible. As a result, HSEs' may employ cognitive effort to sustain chronic approach goals, for example, by bolstering evaluations of relationship quality when faced with rejection concerns or by resisting temptation to quit in the face of adversity (Di Paula & Campbell, 2002). Similarly, LSEs may cognitively buttress chronic avoidance goals when risk is salient, for example, by derogating their relationships and by minimizing the importance of a given task when it goes poorly. HSEs' and LSEs' divergent regulatory approaches may result

from cognitive support for situational goals that ‘fit’ their chronic goal orientations (Higgins, 2005). Though more research is needed to determine the precise mechanism underlying the strengthening and inhibition of approach goals by HSEs and LSEs, respectively, the current data suggest several avenues for exploration.

### **Future Research**

The present studies demonstrated that responses to risk had relatively immediate effects on self-regulation. Future research is warranted to determine the longer-term implications of such strategies. HSEs’ and LSEs’ differential shifts in approach motivation in the face of risk are likely to have profound consequences when examined over a prolonged period of time. Such extended effects have already been demonstrated in interpersonal contexts, including one examination revealing that LSEs’ self-protective responses undermined relationship well-being over the course of a year whereas HSEs’ inclination toward connectedness substantially improved it (Murray, Holmes, & Griffin, 2000). Because these interpersonal risk regulation strategies apply to non-interpersonal domains, it is worthwhile to examine whether LSEs experience more negative outcomes than HSEs in career or financial domains as well. Prior investigations have shown that self-esteem is positively related to a number of outcomes including academic achievement (e.g., Hansford & Hattie, 1982) and job satisfaction and performance (Judge & Bono, 2001). While the causal link between these outcomes and self-esteem is controversial (see Baumeister, Campbell, Krueger, & Vohs, 2003), the present findings suggest that these associations may be explained in part by the divergent regulatory responses of HSEs and LSEs. HSEs may experience more positive outcomes than LSEs because they are willing to take risks when it is most challenging to do so, whereas LSEs are unwilling to leave themselves vulnerable in pursuit of rewards. Future investigations should examine how HSEs

and LSEs divergent self-regulatory responses unfold over time and the extent to which these responses impact more global outcomes.

### **Theoretical Implications**

**Approaching intimacy and avoiding rejection.** The results of the present studies suggest that the relationship-promotive goals so persistently adopted by HSEs in response to interpersonal risk, and to some extent the self-protective actions of LSEs in the same situations (Murray et al., 2002, 2006), may ultimately reflect shifts in global approach motivation not captured in prior research. The finding that relationship threat appears to alter the extent to which HSEs and LSEs attend to positive outcomes generally enhances understanding of relationship-specific risk regulation and underscores its importance to romantic life. Murray et al. (2006) have proposed that because romantic relationships play a unique role in fulfilling belongingness goals but also entail the possibility of intensely painful rejection, a regulatory system developed to manage goal pursuit and behavior in this specific context. The present data develops this theorizing by suggesting that the interpersonal risk regulation system may have “co-opted” a broader existing system that manages general approach and avoidance behavior rather than having developed in isolation. That is, the procedural rules that govern interpersonal risk regulation may have evolved from more fundamental regulatory strategies that govern the pursuit of positive outcomes and avoidance of negative outcomes globally.

This theorizing is consistent with others’ claims that complex systems that govern thoughts and behavior in specific contexts can develop from more fundamental and general psychological mechanisms. For example, MacDonald and Leary (2005) demonstrated that social pain can elicit many of the same physical reactions as physical pain and have proposed that this overlap reflects an evolutionary development from the primitive physical pain regulation system

to the more complex social pain regulation system. A similar idea is seen in attachment research. Adult attachment theories have long speculated that the attachment system that governs romantic relationships has developed from an earlier system that governs bonds between infants and caregivers (Fraley & Shaver, 2000; Hazan & Shaver, 1987). The development of the risk regulation system from the more basic approach/avoidance system may reflect an analogous development to that proposed by attachment theorists.

The present studies also contribute to emerging research on the importance of approach and avoidance motivations to social life. While these motivational orientations have long been theorized to be fundamental to human activity (Elliot & Church, 1997; Higgins, 1997), they may be of particular importance to interpersonal behavior. Emerging research has begun to highlight the ways in which chronic approach and avoidance motivation can shape relationship-specific goals and can drastically affect relationship outcomes (Elliot et al., 2006; Gable, 2006). People who are chronically approach-oriented adopt relationship goals centered on affiliation, which on average, results in great satisfaction with their social bonds. Those who are chronically avoidant, however, adopt relationship goals aimed at avoiding rejection, which ironically results in more loneliness and greater anxiety about social relationships (Gable, 2006). This research, in conjunction with the present results, highlights important links between global motivations and specific relational goals. Not only do chronic approach/avoidance goals influence social outcomes, but relationship events also affect these global motivations, suggesting that the approach and avoidance system may be intertwined with interpersonal life to a greater degree than previously theorized.

**Self-esteem.** The present findings contribute not only to the risk regulation literature, but also to research on self-esteem more broadly. Prior research has argued that self-esteem serves as

a regulatory system that monitors signs of acceptance and rejection in interpersonal relationships (Leary, 2004; Leary & Baumeister, 2000). However, the present studies add to growing evidence demonstrating that regulatory function of self-esteem is more widespread than previously theorized. HSEs in particular seem to apply regulatory strategies similar to those observed in the present studies to self-regulation efforts in a variety of contexts and domains. That is, HSEs react to threatening situations more defensively than do LSEs and engage in riskier strategies to counteract such threats (Baumeister, Heatherton, Tice, & Hutton, 1993).

For example, after a threat to academic competence, HSEs attempt to restore their sense of worth by engaging in a variety of self-enhancing behaviors (Blaine & Crocker, 1993), even if that behavior leads to negative evaluations by others (Heatherton & Vohs, 2000). Similarly, a study by McGregor and Marigold (2003) demonstrated that HSEs reacted to personal uncertainty by bolstering conviction in their beliefs about polarizing and contentious issues (e.g., capital punishment). In these risky situations, HSEs seem to disregard risks and aggressively pursue outcomes that allow them to restore the domain that has been threatened. LSEs, on the other hand, do not react in such a way. Thus, consistent differences between HSEs' and LSEs' self-regulatory responses to risk suggest that differential shifts in approach motivation - that is, a motivation to seek positive outcomes and pursue them despite potential risks - may ultimately underlie these effects. Further research is needed to clarify the extent to which this is the case, but self-esteem clearly exerts a wider regulatory influence than previously theorized.

The present studies also highlight the role of executive control in the operation of these regulatory functions. In Studies 3-5, self-esteem differences in risk regulation were observed only when participants had ample cognitive resources. Self-esteem was less influential when such resources were usurped, resulting in a greater approach motivation for HSEs and inhibited

approach goals for LSEs. This finding has interesting implications for study on the positive benefits of willpower. Many scholars have conceptualized self-control as being highly beneficial to self-regulation and empirical studies have borne out this prediction (Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990; Tangney, Baumeister, & Boone, 2004). Self-control is critical to achieving many positive outcomes and to inhibiting behaviors, for example prejudice (Richeson & Shelton, 2003) and aggression (DeWall, Baumeister, Stillman, & Gailliot, 2007), that can detrimentally affect personal and interpersonal outcomes. For HSEs, this appears to be particularly true. Executive control allows HSEs to set aside risks and pursue positive outcomes that would otherwise be unobtainable. For LSEs, however, executive control is not always beneficial and may operate in a potentially *destructive* manner. LSEs deliberately inhibit approach goals in risky contexts and forfeit many potential rewards as a result. When executive control is usurped, LSEs are less risk averse and thus may be more likely to experience positive events, such as heightened closeness and intimacy with relationship partners (Murray et al., 2008). It seems that for LSEs, self-control fosters engagement in maladaptive regulatory strategies when risk is salient.

This finding contributes to emerging research suggesting that in certain contexts, self-control may undermine people's ability to achieve positive outcomes. For example, it is well-established that intentions to avoid certain thoughts often have the ironic effect of increasing those thoughts (Wegner, 1994, 2009). As well, recent research has demonstrated that attempts by White participants to facilitate smooth interracial interactions with Black participants often lead them to consciously regulate their behavior to not appear prejudiced (Richeson & Trawalter, 2005). However, such efforts not only undermine White participants' enjoyment of the interaction, but also lead them to act in ways that Black people perceive to be *more* prejudiced

(Apfelbaum & Sommers, 2009). When executive control is diminished and behavior inhibition impaired, more positive interracial interactions result (cf. Shelton, Richeson, Salvatore, & Trawalter, 2005). Thus, while self-control is important to achieving many outcomes, it can also facilitate the use of maladaptive regulatory strategies that hinder goal achievement. This may be particularly true for LSEs and warrants further research.

### **Practical Implications**

The knowledge that domain-specific risk activates broader regulatory responses among HSEs and LSEs may be exploited to improve the regulatory outcomes of LSEs, who likely forgo many positive outcomes when pursuing them is risky. The present findings may have practical applications by informing the development of interventions that allow LSEs to circumvent maladaptive self-regulatory strategies. One such intervention may stem from strengthening LSEs' approach motivation generally such that it would 'buffer' them against subsequent declines when faced with risk. If LSEs are encouraged to cognitively reframe goals in a manner that emphasizes positive outcomes (e.g., a promotion focus; Higgins et al., 2001), heightened approach motivation may counteract the tendency for LSEs to inhibit these goals when risk is salient. Preliminary evidence for the effectiveness of this can be seen in a recent study in which LSEs who were instructed to focus on the broader positive implications of a compliment from their romantic partner were less negatively affected by a relationship threat relative to LSEs who did not abstract their partner's compliment (Marigold, Holmes, & Ross, 2010). Thus, heightened sensitivity to positive outcomes may provide LSEs with additional impetus to pursue approach-motivated goals when doing so is potentially risky. The fact that LSEs' regulatory responses are governed by executive control also points to the efficacy of cognitive reframing in reducing the likelihood of negative outcomes. Because these responses result from controlled processes, it

may be possible to train LSEs *not* to apply detrimental procedural rules to risky situations.

Although future research is warranted to examine how best to counteract these undoubtedly well-practiced responses to risk, the possibility that LSEs may be able to consciously counteract such tendencies may allow them to experience many of the same personal and interpersonal outcomes that HSEs do.



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