The Tell-Tale Heart: Self-Esteem and Physiological Responses to Social Risk

by

Eric Huang
B.Sc., University of Toronto, 2008

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Supervisory Committee

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Abstract

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Risky social situations afford the chance to obtain social rewards like acceptance and belonging but also afford the chance of suffering social costs like rejection and social pain. Extant research indicates that social risk triggers approach motivations in higher self-esteem individuals (HSEs) but produces avoidance motivations in lower self-esteem individuals (LSEs; e.g., Stinson et al., 2010). However, no research has investigated the mechanisms that explain this effect: Why does social risk polarize HSEs' and LSEs' social motivations? I propose that self-esteem and social risk interact to activate two primal regulatory systems: the challenge-threat evaluation system and the Behavioral Activation-Inhibition Systems. I test this hypothesis by examining whether self-esteem and social risk interact to predict physiological responses consistent with these primal regulatory systems. Participants experienced either a low or high risk social situation, and heart rate reactivity was measured throughout the studies. Across two experiments, for HSEs (i.e., participants scoring one standard deviation above the sample mean), higher social risk increased heart rate reactivity, suggesting activation of challenge appraisals and the behavior activation system. For LSEs (i.e., participants scoring one standard deviation below the sample mean), higher social risk decreased heart rate reactivity, suggesting activation of threat appraisals and the behavior inhibition system. My research provides evidence that the social regulatory function of self-esteem may have developed from more primal regulatory systems, an observation that increases the comprehensiveness of current self-esteem theories.

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Introduction

Todd and Steve are at a social gathering. Neither knows anyone at the party. This situation contains *social risk*, because the situation affords both rewards and costs (Murray, Holmes, & Collins, 2006). If Todd or Steve attempts to speak to complete strangers, they potentially could have the negative outcome of being socially rejected or they potentially could have the positive outcome of a new social connection. Faced with these dual possible outcomes, Todd decides to approach a group of people and introduce himself, whereas Steve decides to sit on a couch and wait for someone to approach him. Although Todd and Steve are in the same risky social situation, they behave quite differently, and these differences can be explained by differences in self-esteem between the two men. Self-esteem reflects one's perceived relational value (Leary & Baumeister, 2000), and self-esteem influences motivational and behavioral responses to social risk.

Higher self-esteem individuals (HSEs) like Todd are confident in their social value and respond to social risk by pursuing potential social rewards (e.g., Cameron, Stinson, Gaetz, & Balchen, 2010). In contrast, lower self-esteem individuals (LSEs) like Steve doubt their social value, and respond to social risk by avoiding potential costs. Self-esteem differences in social motivation in response to social risk are well-documented in the literature (e.g., Anthony, Holmes, & Wood, 2007a; Baumeister, Tice, & Hutton, 1989; Cameron et al., 2010; Murray et al., 2006; Murray, Derrick, Leder, & Holmes, 2008). However, to date there is little understanding of the precise mechanisms to explain why HSEs respond to social risk with reward pursuit, whereas LSEs respond with cost avoidance. In the present research, I seek to uncover mechanisms to explain the connection between self-esteem and social motivation in risky social situations. Specifically, I suggest that self-esteem differences in social motivation in

response to social risk can be explained by the functioning of two primal regulatory systems that are both responsive to rewards and costs: the Behavioral Activation-Inhibition Systems (BAS-BIS; Gray, 1987, 1990) and the challenge-threat evaluation systems (e.g., Blascovich, 2008; Blascovich & Tomaka, 1996).

I test this hypothesis by examining physiological reactions to social risk as a function of self-esteem, a method that is useful because BAS-BIS activation and challenge-threat evaluations produce characteristic patterns of physiological responses to situational stimuli. I hypothesize that social risk will produce a physiological response consistent with BAS activation and challenge appraisal in HSEs, but social risk will produce a physiological response consistent with BIS activation and threat appraisal in LSEs. If my hypotheses are correct, my research will provide evidence that the social regulatory function of self-esteem may have developed from a more primal challenge-threat regulatory system, thus increasing the comprehensiveness of current self-esteem theories.

Self-Esteem and Social Motivation

Humans are inherently social creatures who require strong social connections to survive (Baumeister & Leary, 1995). This *need to belong* evolved to help humans and other social creatures integrate with groups and make the most solid social connections, behaviors that increased survival and well-being (Baumeister & Leary, 1995). To service the need to belong, self-esteem developed as a *sociometer* that monitors social cues and uses that information to regulate behavior (Leary, 1999). Self-esteem specifically monitors *relational value*, which is one's perception of one's social value to others (Leary, 1999; Leary & Baumeister, 2000). If one feels that his or her relational value is high, then self-esteem is high, but if one feels that his or her relational value is low, then self-esteem is low (Leary, 1999). In turn, the sociometer uses

these perceptions of relational value to guide and regulate behaviors in ambiguous, or risky, social situations (Murray et al., 2006; Murray et al., 2008; Stinson et al., 2010).

Risky social situations afford the chance to obtain social rewards like acceptance and belonging but also afford the chance of suffering social costs like rejection and social pain (MacDonald & Leary, 2005; Murray et al., 2006). Thus, in risky social situations,the need to belong is in conflict with the motivation to avoid rejection (Murray et al., 2008). Self-esteem plays an important role in resolving this motivational conflict.

In risky social situations, LSEs embrace the motivation to avoid social costs and suppress the goal of pursuing rewards, whereas HSEs embrace the motivation to pursue social rewards and suppress the goal of avoiding costs (Murray et al., 2008). In my social gathering example, social risk activates different motivations for Steve and Todd, because the two men differ in self-esteem. Because Steve has lower self-esteem, the social risk at the social gathering activates the motivation to avoid social costs and suppresses the motivation to pursue social connectedness. Conversely, because Todd has higher self-esteem, social risk activates the motivation to pursue social rewards and suppresses the motivation to avoid social costs.

These self-esteem differences in motivation manifest in different behaviors, specifically approach and avoidance behaviors. In risky social situations, HSEs actively pursue (i.e., approach) potential rewards, whereas LSEs avoid potential costs by adopting a cautious and inhibited interpersonal style (e.g., Cameron, Stinson, & Wood, 2013; Heimpel, Elliot, & Wood, 2006; Wood & Forest, 2011). For example, higher self-esteem Todd pursued social rewards by approaching a group of strangers and initiating a conversation, whereas lower self-esteem Steve avoided social costs by sitting on the sidelines of the party and waiting for interested others to approach him.

Because virtually every social interaction affords both rewards and costs, it may seem that such self-esteem differences in social motivation and behavior reflect characteristic self-esteem differences. But this is not the case. If social risk is reduced by downplaying social costs, self-esteem differences in social motivation typically disappear or can even be reversed. Removing social risk decreases LSEs' avoidance motivations (e.g., Cameron et al., 2010; Study 4) and also increases their approach motivations (e.g., Cavallo, Holmes, Fitzsimons, Murray, & Wood, 2012; Study 2) to levels that equal or better their higher self-esteem counterparts. Moreover, there is some preliminary evidence that social risk is a social ingredient necessary to produce HSEs' most relationship-promoting behaviors (e.g., Cameron et al., 2013). Reduce social risk by downplaying potential costs, and HSEs' relationship-promoting behaviors are similarly reduced. Hence, in a low-risk social situation – a situation in which social costs were low yet social rewards were still possible – knowing Steve's and Todd's levels of self-esteem would not help us predict their behavior because idiosyncratic personal differences, *not* self-esteem, predict social motivations in low-risk situations (e.g., Cavallo et al., 2012).

The social regulatory system of self-esteem developed out of an evolutionary need to regulate social behavior for survival and to meet the need to belong. However, it did not develop independently. The social regulatory system likely developed on top of primal reward-cost systems already in place, specifically the Behavioral Activation and Inhibition Systems (BAS-BIS; Gray, 1987, 1990) and the challenge-threat appraisal system (e.g., Blascovich, 1992; Blascovich & Tomaka, 1996). Just like social pain developed using the same substrates as physical pain (Macdonald & Leary, 2005), I propose that the social regulatory system developed based upon the primal regulatory system of BAS-BIS and challenge-threat to achieve its goals.

BAS-BIS, Challenge-Threat, and Self-Esteem

Animals are essentially wired to evaluate rewards and costs in the environment (e.g., Collier, Hirsch, & Hamlin, 1972; O'Connell, 1988). Basic neural structures developed to regulate animals towards rewards and away from costs (e.g., Cousins, Atherton, Turner, & Salamone, 1996; Schweimer, Saft, & Hauber, 2005). Two modern theories developed to describe important systems that achieve such regulation: the more basic BAS-BIS theory and the challenge-threat response system.

In Gray's two-factor learning theory (Gray, 1987, 1990), he proposes two fundamental neuropsychological systems that influence behavior: BAS and BIS. The BAS responds to positive stimuli and reward with active behavior (e.g., approach or aggression; Gray, 1987, 1990). The BIS, on the other hand, responds to negative stimuli and costs with passive behavior (e.g., inhibition; Gray, 1975, 1976, 1987).The BAS and BIS make up a primal regulatory system that functions in most creatures. The theoretical predictions concerning the function of the BAS and BIS have been validated in creatures as diverse as rats (e.g., Gray, 1976) and even cockroaches (e.g., Eiserer & Ramsay, 1981). Of course, BAS-BIS functioning has also been validated in humans (e.g., Gray, 1987).

In humans, the BAS and BIS function by monitoring rewards and costs, and the levels of reward and costs determine subsequent behavior (Gray, 1987). Both the BAS and the BIS can be activated simultaneously, depending on the different types of stimuli in the environment. However, many situations activate one system more than the other. If perceived rewards are greater than perceived costs, the BAS is predominantly activated, and a person will approach a situation. If perceived costs are greater than perceived reward, the BIS is predominantly activated, and a person will not approach a situation. This account of BAS-BIS functioning

implies that an evaluative appraisal of rewards and costs takes place prior to activation of the BAS or BIS. As such, the BAS and BIS appear to be connected to another primal, reward-cost sensitive regulatory system: the *challenge-threat response system* (e.g., Blascovich, 1992; Blascovich & Seery, 2007; Blascovich & Tomaka, 1996; Tomaka, Blascovich, Kelsey, & Leitten, 1993; Tomaka, Blascovich, Kibler, & Ernst, 1997). This evaluative model suggests that in goal-relevant situations where people are motivated to perform well, people evaluate the demands of the situation (i.e., what behaviors, skills, or abilities are required to obtain desired rewards) and evaluate their own available resources to achieve the desired rewards (i.e., what behaviors, skills, or abilities are available to direct towards efforts to obtain desired rewards). A *challenge appraisal* occurs if a person perceives that he or she has more resources available for the goal-relevant situation than the situation demands. Challenged individuals respond to potentially stressful situations with active, goal-directed approach behaviors (Blascovich, 2008). Stated this way, it seems that challenge appraisals are linked to the BAS, which similarly guides active approach behaviors aimed at achieving desired rewards. In contrast, a *threat appraisal* occurs if one perceives that the goal-relevant situation demands more resources than he or she has available (e.g., Blascovich & Seery, 2007). Threatened individuals respond to potentially stressful situations with passive, deactivating avoidance behaviors (Blascovich, 2008). Again, this characterization suggests that threat appraisals are linked to the BIS, which also suppresses goal-pursuit in favor of avoidance behaviors aimed at avoiding undesirable costs.

The self-esteem, BAS-BIS, and challenge-threat systems all function on the basis of rewards and costs, just on different levels. The primal regulatory system of BAS-BIS responds to basic rewards and costs (e.g., physical pleasure and pain). The challenge-threat system responds to all manner of rewards and costs, both basic and higher-order (e.g., success and failure). Self-

esteem is more specialized and responds to higher-order *social* rewards and costs (e.g., belongingness and rejection). Essentially, the self-esteem system extends the function of the BAS and BIS into the domain of social relationships.

The preceding discussion of the BAS-BIS and challenge-threat regulatory systems evidences clear parallels to the motivational and behavioral responses to social risk as a function of self-esteem. Risky social situations afford both rewards and costs, suggesting that risky social situations will activate the BAS-BIS and challenge-threat systems, both of which are sensitive to rewards and costs. Moreover, in risky social situations, HSEs demonstrate approach motivations and LSEs demonstrate avoidance motivations (e.g., Anthony, Wood, & Holmes, 2007b; Baumeister, Tice, & Hutton, 1989; Cameron et al., 2010; Cavallo et al., 2012; Heimpel et al., 2006; Murray et al., 2006; Murray et al., 2008). This implies that risky social situations activate BAS for HSEs and BIS for LSEs. Furthermore, I suggest that challenge-threat appraisals explain why HSEs display BAS activation in risky social situations but LSEs display BIS activations. Though I discuss challenge-threat and BAS-BIS comparatively, the two systems do not overlap completely; they are just very strongly associated.

The concepts of BAS-BIS suggest that a cognitive appraisal must occur before activation, and challenge-threat appraisals provide such an explanation. HSEs anticipate acceptance from social partners (e.g., Stinson, Cameron, Wood, Gaucher, & Holmes, 2009) and report blithe confidence in their social skills and relational value (e.g., Anthony et al., 2007a; Leary & Baumeister, 2000). Taken together, this constellation of social and personal beliefs suggest that HSEs will perceive the potential costs inherent to risky social situations, but will believe that they possess the resources necessary to overcome those demands and successfully obtain potential rewards. Therefore, HSEs will conclude that risky social situations are challenging. In

contrast, LSEs anticipate a cool reception from interaction partners (Stinson et al., 2009) and doubt their relational value (Leary & Baumeister, 2000), suggesting that LSEs will perceive the potential costs inherent to risky social situations but will believe that they do not possess the resources necessary to overcome those demands and obtain potential rewards. Thus, LSEs will conclude that risky social situations are threatening. HSEs' challenge appraisals and LSEs' threat appraisals in risky social situations would provoke BAS and BIS activation respectively, which in turn explains HSEs' approach behaviors in response to social risk but LSEs' avoidance behaviors in response to social risk.

Consistent with my proposals, prior research demonstrates connections between BAS-BIS activation, challenge-threat appraisals, and self-esteem. For example, Erdle and Rushton (2010) found that BAS-sensitivity is positively correlated with self-esteem and that BIS-sensitivity is negatively correlated with self-esteem. Thus, when self-esteem is higher, individuals score higher on the BAS scale; when self-esteem is lower, individuals score higher on the BIS scale. Avoidance is also negatively correlated with self-esteem, negatively correlated with BAS-sensitivity, and positively correlated with BIS-sensitivity (Heimpel et al., 2006). In addition, when faced with ambiguous self-relevant stimuli that affords both potential rewards and costs, HSEs activate approach-related goals in order to increase favorable outcomes, whereas LSEs activate avoidance-related goals to prevent unfavorable effects (Heimpel et al., 2006). This suggests that HSEs perceive risky social situations to be challenging, whereas LSEs perceive the same situations to be threatening. Furthermore, self-esteem is correlated with global challenge-threat orientations, such that HSEs are more likely to make challenge appraisals and LSEs are more likely to make threat appraisals in an ambiguous but goal-relevant social situation (Lupien, Seery, & Almonte, 2012).

Extant research, however, suggests that the association between the BAS-BIS and challenge-threat systems and self-esteem is dispositional. My research proposes a more complex association between self-esteem, BAS-BIS, and challenge-threat, an association whereby self-esteem interacts with social risk to predict challenge-threat and BAS-BIS activation. In risky social situations, HSEs make a challenge appraisal and thus experience BAS activation, leading to approach behaviors. In contrast, in risky social situations, LSEs make a threat appraisal and thus experience BIS activation, leading to avoidance behaviors, or at least lower levels of approach behaviors. However, in situations with no social risk, where social costs are significantly reduced, I predict that self-esteem will not predict challenge-threat or BAS-BIS activation, a prediction that is consistent with research suggesting that self-esteem does not predict motivation or behavior in low risk social contexts (e.g., Cameron et al., 2010).

In the present thesis research, I will attempt to connect the self-esteem regulatory system to the BAS-BIS and challenge-threat systems by examining physiological responses to social risk. Although I could test my hypotheses using self-reports of challenge-threat and BAS-BIS, I will utilize a more objective approach. BAS-challenge and BIS-threat activation yield distinctive physiological signatures. Therefore, I will manipulate social risk and then observe physiological responses as a function of self-esteem to test my hypotheses.

BAS-BIS activation predicts physiological responses, most notably changes in heart rate (HR). Fowles (1980, 1988) suggested that reward increases HR, and cost decreases HR. Because reward is associated with BAS activity and punishment is associated with BIS activity, BAS activation is likely to be associated with a higher HR and BIS activation is likely to be associated with a lower HR (Fowles, 1980, 1988). Heponiemi and her colleagues replicated these results by

finding that BAS activation predicted increased HR reactivity (Heponiemi, Keltikangas-Järvinen, Kettunen, Puttonen, & Ravaja, 2004).

Similar HR reactions accompany challenge-threat evaluations. Although HR reactivity (i.e., changes in HR from baseline) is positive in both challenge and threat appraisals, HR reactivity is significantly higher with challenge appraisals than with threat appraisals (e.g., Blascovich & Tomaka, 1996; Tomaka et al., 1993; Tomaka et al., 1997). Blascovich and his colleagues have not only used HR reactivity to index challenge-threat but have also used ventricular contractility, cardiac output, and total peripheral resistance as physiological measures of challenge and threat appraisals (e.g., Blascovich & Tomaka, 1996).Challenge states increase cardiac activity (e.g., HR, ventricular contractility, and cardiac output) but decrease total peripheral resistance (e.g., Blascovich & Mendes, 2000). Threat states either maintain cardiac activity or increase it a little but significantly less than challenge states (e.g., Tomaka et al., 1997). Threat states also increase total peripheral resistance, which increases blood pressure. In their more recent research, Blascovich and his colleagues have been concentrating solely on cardiac output and total peripheral resistance to measure physiological differences between challenge and threat appraisals (e.g., Blascovich, Seery, Mugridge, Norris, & Weisbuch, 2004). It appears that Blascovich and his colleagues changed their interpretation of HR reactivity from earlier research where they conceptualized HR reactivity as an indicator of challenge-threat (e.g., Tomaka et al., 1993) to instead reflect task engagement (the motivation to perform well in a situation). Although the authors do not explicitly provide rationale for this shift in their many publications, I suspect that the authors changed their focus because HR reactivity is a less precise and sensitive measure of challenge-threat appraisals than cardiac output and total peripheral resistance. For example, Tomaka et al. (1997) found marginally significant effects and

Blascovich et al. (1999) found an insignificant trend between HR reactivity and challenge-threat, although in both studies the pattern of results for HR reactivity was similar to earlier studies. Yet, in both studies cardiac output and total peripheral resistance yielded strongly significant effects. Although HR reactivity can reflect challenge-threat appraisals (e.g., Tomaka et al., 1993; Tomaka et al., 1997), it appears that other measures are more sensitive. Even so, Blascovich and his associates' newer measures of challenge-threat still use HR indirectly to differentiate challenge-threat by using cardiac output, which is calculated by multiplying HR and stroke volume (e.g., Blascovich & Tomaka, 1996). Therefore, although Blascovich and his colleagues have moved away from using HR reactivity as a direct measure of challenge-threat, their previous research suggests that HR reactivity strongly reflects challenge-threat evaluations.

In sum, BAS activation and challenge evaluations both prompt increases in HR that are significantly higher than the HR increases during BIS activation and threat appraisals. I hypothesize that social risk will produce a physiological response consistent with BAS activation and challenge appraisal in HSEs, but social risk will produce a physiological response consistent with BIS activation and threat appraisal in LSEs. No previous research has associated challenge-threat and BAS-BIS with social risk and self-esteem. Thus, due to the preliminary nature of my thesis research, I decided to use a general and easy to assess physiological indicator of challenge-threat activation and BAS-BIS activation: HR reactivity. HR reactivity serves as a general physiological measure that is robust and easier to administer than other indicators of challenge-threat, specifically cardiac output or total peripheral resistance, neither of which has been associated with BAS-BIS to date. In contrast, the HR predictions of challenge-threat overlap with those of BAS-BIS.

Therefore, I predict that social risk will interact with self-esteem to predict HR reactivity, such that self-esteem will be more strongly, and positively, related to HR reactivity in social situations with *high* social risk than in situations with *low* social risk. Put another way, high social risk will cause HSEs to have greater HR reactivity than LSEs.

I test these hypotheses in two experiments that use similar methods, allowing me to replicate and validate my findings. If my hypotheses are correct, my research will provide evidence that the social regulatory function of self-esteem may have developed from a more primal challenge-threat regulatory system, thus increasing the comprehensiveness of current self-esteem theories.

Pilot Study

In my current research, I measured global self-esteem and manipulated social risk to examine the effects on HR reactivity. To manipulate social risk, I used the constrained communications paradigm borrowed from Cameron and her colleagues (2010), which involves deceiving male participants into believing they would have a limited interaction through a live web camera with a female participant who actually does not exist. Social risk is manipulated by making the participant believe that he could meet this other participant later *if she chooses* (i.e., high social risk) or that there was no chance of meeting after the video interaction (i.e., low social risk). Thus, in my research, I manipulate the likelihood of rejection as a social cost, not other types of social costs like inadequacy or embarrassment. This paradigm has been shown to significantly manipulate social risk in previous research (e.g., Cameron et al., 2010).

Methods

Participants. Forty-five single, Canadian-born, male, introductory psychology students who reported English as a first language participated (M_{age} = 19.40 years, SD_{age} = 2.24 years). I

sampled single participants because past research has found that participants in relationships have different behaviors and reactions to social risk compared to single participants (e.g., Frankenhuis & Karremans, 2012). The restriction to male participants was there to reduce the number of between-subject variables. I sampled Canadian-born English speakers because there are cultural differences in the social function of self-esteem (e.g., Tafarodi, Lang, & Smith, 1999). Finally, I sampled introductory students because those who have taken higher-level psychology courses have a larger probability of guessing the experimental hypotheses and detecting the deception. In appreciation for their time, participants received extra credit and candy.

Procedure and Measures. Participants completed the study individually. After signing a consent form (Appendix A), the female experimenter helped the participants put on the iWorx PHRM-100 Polar Heart Rate Monitor. The monitor was connected to the iWorx 214 Data Recorder, and the LabScribe 2 program recorded the data on the computer at a sample rate of 100 Hertz. After adorning the monitor, there was a five-minute resting period to habituate the participant to the apparatus and record a baseline HR measure (e.g., Mendes, Blascovich, Major, & Seery, 2001). The participants remained connected to the HR monitor for the duration of the experiment.

The researcher then loaded a preliminary computerized survey (Appendix C) that included the 10-item Rosenberg Self-Esteem Scale (1965; e.g., "I feel that I have a number of good qualities;" "I certainly feel useless at times"), which used a 9-point scale (1 = *very strongly disagree*, 9 = *very strongly agree*; $\alpha = .854$). The preliminary survey also included demographic questions (e.g., age) and filler questions that disguised my focus on self-esteem.

Next, participants learned about the social interaction task that they would complete during the lab session (Appendix B). Participants were informed that there was a female participant in the adjacent lab room, and the participants and their partner would be communicating with one another via video camera as part of a "constrained communication exercise." First, the participants would introduce themselves to their interaction partner by speaking into a video camera in the participants' own lab room. The interaction partner would then watch the participants' introductory tape and film a response, which the participants would watch.In the *risk condition*, the researcher also said:

> Sometimes participants wonder if they will get to meet their interaction partner face to face after making these videos. The good news is that you two *can* meet each other face to face, but only if the other participant decides that she wants to meet you. So after watching each others' videos, I'll ask the other participant if she is interested in meeting you face-to-face. If she says yes, I'll bring her to this room and you can meet. If she says no, then that will be the end of the study.

In contrast, in the *no risk condition*, the researcher said:

> Sometimes participants wonder if they will get to meet their interaction partner face-to-face after making these videos. Regulations for running studies here actually mean that I can't let you meet face-to-face, so there isn't any possibility of meeting the other participant, even if you wanted to. Watching each other's videos will be the only contact that you have with each other.

After learning about the interaction task, participants completed a second computerized survey that is not relevant to the present research (Appendix D). At this point, the experiment was finished; participants did not film an introductory video.

The researcher disconnected the physiological devices, debriefed the participants fully about the deception used (Appendix G), and gave participants their credit and choice of candy.

Results and Discussion

Data from six participants were excluded due to technical difficulties with the heart rate monitor (e.g., readings of zero, extreme fluctuations in a short time).

The HR data were sampled at 100 Hz, indicating there were 100 data points per second. To prepare the raw data for analysis, I aggregated the data points into 10-second increments by obtaining the mean value of all the data points for each 10-second increment. Based on these 10-second means, I calculated each participant's average HR during the five-minute acclimation period (*baseline HR*; $M = 75.12$, $SD = 14.37$; e.g., Mendes et al., 2001). I also identified the single highest 10-second HR achieved after the five-minute acclimation period during the rest of the lab session (*maximum study HR*; $M = 97.90$, $SD = 13.07$). Results of a regression in which mean-centered self-esteem ($M = 7.33$, SD = 1.14), dummy-coded condition (no risk = 0, risk = 1), and the interaction between the variables were used to predict participants' baseline HR did not yield any significant effects, all *t*s < 1. Thus, following norms within the psychophysiology literature (e.g., Seery, Blascovich, Weisbuch, & Vick, 2004; Tomaka et al., 1993), I subtracted baseline HR from maximum study HR to yield a *study HR reactivity* score for each participant ($M = 22.78$, $SD = 9.60$), which served as the main dependent variable. Although change scores are sometimes discouraged on psychometric grounds (e.g., Cronbach & Furby, 1970), reactivity scores are commonly used in psychophysiological research and are as reliable as other analytic approaches (Blascovich et al., 2004).

Next, I entered mean-centered self-esteem, dummy coded condition, and their interaction into a regression to predict HR reactivity ($M = 22.78$, SD = 9.60). Following norms from the

psychophysiology literature, I also entered baseline HR as a control variable in the analysis (e.g., Blascovich et al., 2004; Seery et al., 2004; Seery, Weisbuch, & Blascovich, 2009; Shiumizi et al., 2011). The purpose of controlling for baseline is to control for correlations between baseline HR and study HR reactivity, which reduces one of the potential problems with using difference scores in data analysis: confounding between baseline levels and magnitude of change (Blascovich et al., 2004). In the present sample, people with higher baseline HR did have lower study HR reactivity, $r = -.46$, $p = .003$. Thus, controlling for baseline HR in my regression analysis is appropriate and should allow the predicted self-esteem by social risk condition effects to be more easily detected than if I did not control for baseline.

No main effects emerged from the regression analysis described above, but results revealed the predicted interaction between self-esteem and condition, $\beta = .39$, $t(38) = 2.23$, $p = .033$.[1] The regression results are presented in Table 1, and the regression equation is graphed in Figure 1 following recommended norms in the field (e.g., Aiken & West, 1991). Thus, the regression equation is graphed for individuals scoring one standard deviation above the sample mean on the self-esteem scale (i.e., HSEs) and for individuals scoring one standard deviation below the sample mean on the self-esteem scale (i.e., LSEs). Note that the values in Figure 1 are not derived from splitting the file in any way; the regression equation yielded from analysis using the entire sample was used to produce *estimated* means for HSEs and LSEs as depicted in Figure 1. I decomposed this interaction using simple effects analyses as recommended by Aiken and West (1991), a method that once again uses the entire sample to estimate simple effects.

[1]Controlling for baseline HR influenced the intercept in this regression, which is why scores on this graph are higher than the mean HR reactivity score might lead one to expect. My focus is on self-esteem differences in reactivity as a function of risk, not on absolute HR values, so the scale of these results does not matter. The same note will apply to the HR reactivity results of the main study.

Self-esteem was unrelated to study HR reactivity in the no risk condition, β = -.06, t < 1, but was positively related to HR reactivity in the risk condition, β = .58, $t(38) = 2.54$, p = .016, such that HSEs had higher study HR reactivity than LSEs. Moreover, in the high social risk condition, HSEs' study HR reactivity tended to be *higher than* HSEs' study HR reactivity in the no social risk condition, β =.39, $t(38) = 1.89$, p = .068. In contrast, the social risk condition effect for LSEs' study HR reactivity was not statistically significant, β = -.28, $t(38) = -1.36$, p = .182. The pattern of effects was similar when I did not include baseline HR as a control variable, although the statistical significance of the various comparisons was adversely affected by omitting baseline HR as a control variable. These offer some preliminary evidence for my hypotheses, but the results require replication and validation. I undertake this task in the Thesis Study.

Table 1

Hierarchical Multiple Regression Analyses Predicting Study HR Reactivity in the Pilot Study

Predictor	Study HR Reactivity				
Step 1	S.E.	ß	*t*	*p*	f^2
Self-Esteem	1.47	-0.06	-0.34	0.735	0.045
Condition	2.66	0.05	0.38	0.710	0.014
Baseline HR	0.09	-0.44	-3.10	0.004	0.238
Step 2					
Self-Esteem x Condition	2.43	0.39	2.23	0.033	0.106

Note. S.E. = Standard Error. Standard deviation for study HR Reactivity was 9.60.

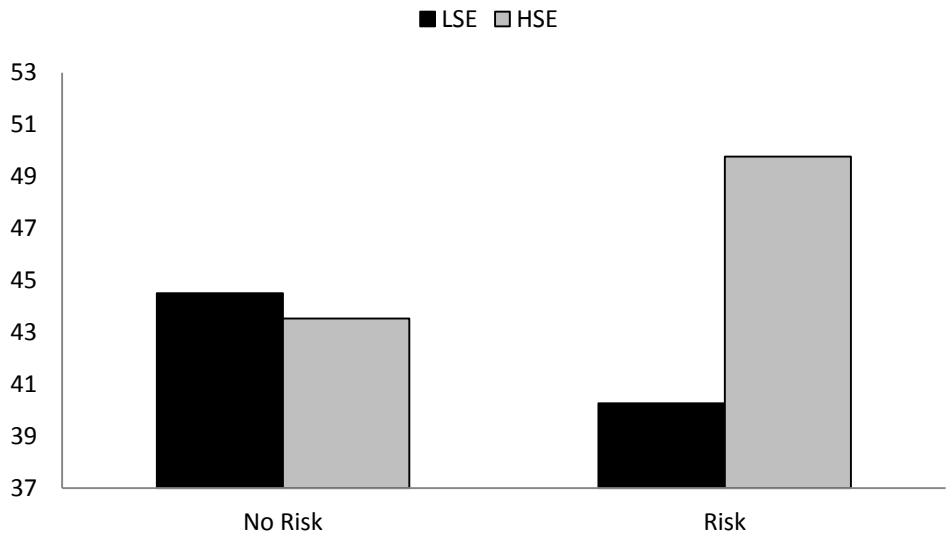

Figure 1. Study HR reactivity as a function of self-esteem and risk condition in the Pilot Study. Results are graphed for individuals scoring one standard deviation above (HSEs) and below (LSEs) the sample mean on self-esteem.

The Thesis Study

In the Thesis Study, I replicate and extend the Pilot Study by assessing HR reactivity while participants film their introductory video for their interaction partner.

Methods

Participants. Sixty-eight, single, Canadian born, male, introductory psychology students who reported English as a first language participated (M_{age} = 19.64 years, SD_{age} = 2.92 years). My justifications for selecting participants with these demographic characteristics are the same as those described in the Pilot Study. In appreciation for their time participants received extra credit and a candy.

Procedures and Measures. The procedures for the Thesis Study were identical to the Pilot Study, except for some notable differences. In the initial survey, I added a question that

assessed sexual orientation.[2] As well, after completing the second survey (Appendix D), participants filmed an introductory video for their interaction partner.

In the video, participants answered seven questions about themselves (Appendix E; Cameron et al., 2010). Participants believed their introductory video was live-streaming to their female interaction partner.

After completing their introductory video, participants completed a third computerized survey unrelated to the present research (Appendix F).

At this point, the experiment was finished. The researcher disconnected the physiological devices, debriefed the participant fully about the deception used (Appendix G), and gave participants their credit and choice of candy.

Results and Discussion

Data from three participants were excluded due to technical difficulties with the HR monitor (i.e., readings of zero during the key time period). One participant was excluded because he was more than three standard deviations below the mean on self-esteem. Five participants indicated that they had exercised in the two hours prior to the study, so we controlled for this variable in the analyses that follow.

Once again, I reduced the continuous output of the HR monitor by calculating 10-second-interval means for the entire study period. Based on these 10-second interval means, I calculated *baseline HR* (M = 79.19, SD = 13.53) and identified the highest 10-second HR achieved while participants filmed their introductory video (*video maximum HR;* M = 105.89, SD = 16.39). My data analytic strategy was the same as that described in the Pilot Study. A regression in which

[2]For the Thesis Study, I excluded four homosexual or bisexual participants from the final analysis because I was interested in studying risk-regulation during romantic relationship initiation (and the "interaction partner" was female).

mean-centered self-esteem (M = 7.53, SD = 0.94), dummy-coded condition (no risk = 0, risk = 1), and the interaction between the variables were used to predict participants' baseline HR did not yield any significant effects, all ts < 1.56. Thus, once again following norms within the psychophysiology literature (e.g., Tomaka et al., 1993), I subtracted baseline HR from maximum video HR to yield a *video HR reactivity* score for each participant (M = 26.70, SD = 14.70). For all participants, max HR for the video was the same as the max HR for the entire study. Once again, baseline HR was negatively correlated with video HR reactivity, r = -.33, p = .008, so as in the Pilot Study, I controlled for baseline HR in the analyses that follow.

Then I entered mean-centered self-esteem, dummy coded condition, and the interaction between variables into a regression predicting participants' video HR reactivity, using baseline HR as a control variable. No main effects were evident, but once again the predicted interaction between self-esteem and risk condition emerged, β = .39, $t(63)$ = 2.57, p = .013. The regression results are presented in Table 2, and the estimated means for individuals scoring one standard deviation above the sample mean on the self-esteem scale (i.e., HSEs) and for individuals scoring one standard deviation below the sample mean on the self-esteem scale (i.e., LSEs) is graphed in Figure 2. Once again, I decomposed this interaction using simple effects analyses as recommended by Aiken and West, 1991). Self-esteem was not significantly related to video HR reactivity while filming the introductory video in the no risk condition, β = -.19, $t(63)$ = -1.28, p = .204, whereas self-esteem was positively related to video HR reactivity in the high social risk condition, β = .46, $t(63)$ = 2.29, p = .026. Moreover, in the high social risk condition, HSEs' video HR reactivity tended to be *higher than* HSEs' video HR reactivity in the no social risk condition, β =.32, $t(63)$ = 1.76, p = .084. In the high social risk condition, LSEs' video HR

reactivity was *lower than* LSEs' HR reactivity in the no social risk condition, β = -.35, $t(63)$ = -2.08, p = .042.

Table 2

Hierarchical Multiple Regression Analyses Predicting Video HR Reactivityin the Thesis Study

Predictor	Video HR Reactivity				
Step 1	S.E.	ß	*t*	*p*	f^2
Self-Esteem	2.31	-0.19	-1.28	0.204	0.003
Condition	3.43	-0.02	-0.13	0.894	0.003
Baseline HR	0.13	-0.38	-3.15	0.003	0.117
Exercise	6.03	-0.19	-1.55	0.126	0.014
Step 2					
Self-Esteem x Condition	3.97	0.39	2.57	0.013	0.098

Note. S.E. = Standard Error. Standard deviation for video HR Reactivity was 14.70.

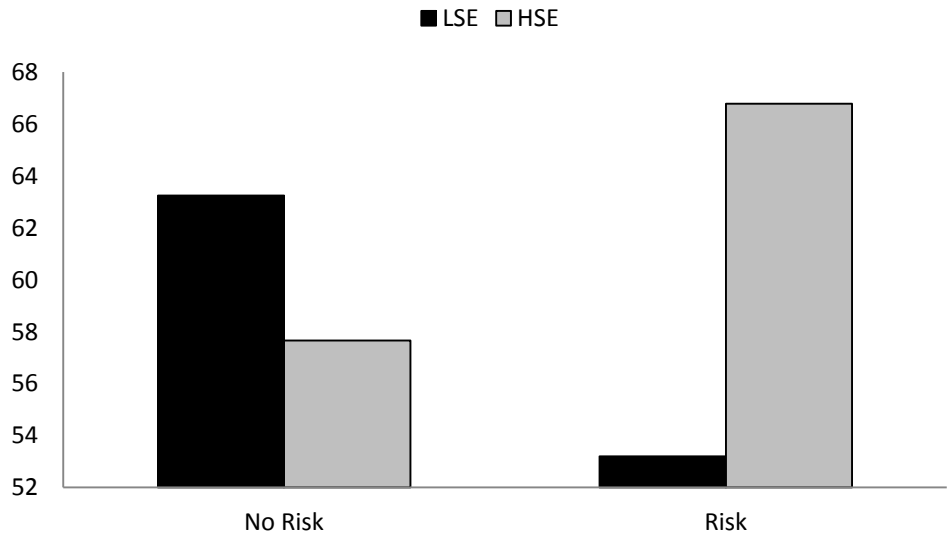

Figure 2. HR reactivity as a function of self-esteem and risk condition in the Thesis Study. Results are graphed for individuals scoring one standard deviation above (HSEs) and below (LSEs) the mean on self-esteem.

General Discussion

The purpose of the present research was to connect the self-esteem regulatory system to the more primal regulatory systems of challenge-threat and BAS-BIS. Providing evidence to connect these systems would help to explain why self-esteem and social risk interact to predict approach-avoidance motivations and behavior.

I hypothesized that the interaction between social risk and self-esteem would lead to physiological responses that reflect the mechanisms of challenge-threat appraisals and BAS-BIS activation. Specifically, social risk would lead to higher HR reactivity for HSEs than for LSEs. This hypothesis stems from the prediction that social risk activates challenge appraisals and the BAS for HSEs, which are both associated with increased HR reactivity (e.g., Fowles, 1988; Tomaka et al., 1997). In contrast, social risk activates threat appraisals and the BIS for LSEs, which are both associated with lower HR reactivity than BAS-challenge activation. Results supported my hypotheses. Meta-analysis of the condition effects for LSEs and HSEs across the Pilot Study and the Thesis Study revealed that HSEs' HR reactivity was *higher* in the high social risk condition than in the no social risk condition,(d = .33, Z = 2.51, p = .012), whereas LSEs' HR reactivity was *lower* in the high social risk condition than in the no social risk condition,(d = -.26, Z = 2.38, p = .017). Moreover, meta-analysis of the self-esteem effects within the no risk and risk conditions across the Pilot Study and the Thesis Study revealed that self-esteem was not related to HR reactivity in the low social risk conditions (d = -.05, Z = 1.05, p = .292), but self-esteem was strongly and positively related to HR reactivity in the high social risk conditions (d = .54, Z = 3.28, p = .001).

This pattern of results mirrors how the interaction between self-esteem and social risk predicts approach-avoidance motivations and behavior (e.g., Cameron et al., 2010), suggesting

that BAS-BIS and challenge-threat reactions may indeed underlie self-esteem differences in motivational reactions to social risk.

I extend existing models of risk-regulation to explain *why* self-esteem and social risk interact to influence approach-avoidance behavior. In this proposed extended model, the interaction between self-esteem and social risk leads to an appraisal of challenge or threat. The challenge-threat appraisal is a necessary step to trigger the activation of the BAS or BIS. The challenge-threat appraisal and the BAS-BIS activation then lead to approach-avoidance motivations and behaviors.

The present results provide preliminary evidence for my proposed extended model of risk-regulation by showing that physiological reactions to social risk as a function of self-esteem are consistent with BAS-BIS activation and challenge-threat reactions to social risk as a function of self-esteem. Thus, my results lend support to the notion that challenge-threat and BAS-BIS processes likely prompt approach-avoidance behavior as a function of self-esteem and social risk. This model provides a more comprehensive explanation of social motivation than is currently available in the risk-regulation literature.

Implications for Existing Theory

Prior research demonstrates connections between BAS-BIS activation, challenge-threat appraisals, and self-esteem. BAS-sensitivity is positively correlated with self-esteem, and BIS-sensitivity is negatively correlated with self-esteem (Erdle & Rushton, 2010). Avoidance is also negatively correlated with self-esteem, negatively correlated with BAS-sensitivity, and positively correlated with BIS-sensitivity (Heimpel et al., 2006). Furthermore, self-esteem is correlated with global challenge-threat orientations, such that HSEs are more likely to make challenge appraisals and LSEs are more likely to make threat appraisals in an ambiguous but goal-relevant

social situation (Lupien et al., 2012). However, my research suggests that the relation between self-esteem, challenge-threat, and BAS-BIS is dynamic as opposed to purely dispositional; self-esteem interacts with social risk to activate challenge-threat and BAS-BIS. Although the association between self-esteem, challenge-threat, andBAS-BIS in risky social situations is consistent with extant correlational research, self-esteem may actually be independent from challenge-threat and BAS-BIS in low-risk social contexts.

My theorizing may also provide an explanation for how BAS-BIS functions in social situations. In extant BAS-BIS theory, there seems to be a missing step between stimulus and response: How does one determine the rewards and costs of an activity or a situation? Challenge-threat evaluations help answer this question. One first determines whether or not a situation is goal-relevant, and then one determines whether or not one possesses resources sufficient to deal with situational demands. Then, BAS-BIS is activated. Future researchers should explore this potential sequence of stimulus → evaluation → motivation.

My results and proposed model also contribute to self-esteem theory. First, my proposed model connects a more specific, higher order self-regulatory system that concentrates solely on social self-regulation (i.e., the self-esteem system) to broader regulatory systems that do not just apply to social situations (i.e., BAS-BIS and challenge-threat). By connecting self-esteem to challenge-threat, my research generates new hypotheses. For example, I propose that attributions of arousal will influence challenge-threat appraisals and thus influence approach-avoidance motivations. In essence, if an individual attributes arousal to the social situation, as they do in risky situations, then HSEs will exhibit more approach behaviors than LSEs. However, if an individual attributes arousal to exercise or another non-social source, this attribution should eliminate self-esteem differences in motivation. If arousal does not signal the presence of social

risk, individuals will behave as if there were no social risk. Future research should test this hypothesis.

By connecting self-esteem with the BAS and BIS systems, my theorizing lends credence to the sociometer proposal that self-esteem is an evolution-based psychological construct (e.g., Leary, Tambor, Terdal, & Downs, 1995). The self-esteem system may have developed from the more primal BAS-BIS regulatory system. The primal regulatory system of BAS-BIS responds to basic rewards and costs (e.g., physical pleasure and pain). Self-esteem is more specialized and responds to higher-order social rewards and costs (e.g., belongingness and rejection). Essentially, the self-esteem system extends the function of the BAS and BIS in to the domain of social relationships. My results and the model I present suggest that future researchers can develop a more comprehensive reward-cost theory that includes hierarchical tiers of rewards/costs and parallel hierarchical tiers of specialized regulatory systems to process each category of rewards/costs. In turn, such developments will help develop a more comprehensive self-esteem theory.

Although a large body of research suggests that HR reactivity reflects challenge-threat evaluations (e.g., Tomaka et al., 1993; Tomaka et al., 1997), the most recent incarnation of challenge-threat theory conceptualizes HR reactivity as an indicator of task engagement. Task engagement reflects how relevant a task is to one's personal goals (e.g. Blascovich et al., 2004). An individual is engaged if they exhibit increases in HR in a given situation (e.g., Seery et al., 2004). In my research, all participants exhibited increases in HR from baseline during the study, suggesting that all participants were engaged in the social context. At present, this is the most that can be concluded about my data using the current conceptualization of the link between HR reactivity and engagement. However, such a simple interpretation of my results overlooks

important nuances in my data. In my opinion,a challenge-threat explanation is equally valid and leads to a more comprehensive model than a simple task-engagement account. As I argued in the introduction, HR reactivity can also signify challenge-threat activation because HR reactivity is higher during challenge evaluations than threat evaluations (e.g., Blascovich & Tomaka, 1996; Tomaka et al., 1993; Tomaka et al., 1997). My model focuses on a challenge-threat interpretation because there is presently a more developed theory linking HR reactivity to challenge-threat than to task engagement. A model centered on task engagement would be too simple when the actual pattern is complex. The inclusion of challenge-threat evaluations leads to a more comprehensive model than if I had included only task engagement.

To better fit my data, it is possible to consider task engagement in a continuous manner. If I interpret discrete changes in HR reactivity as reflecting changes in task engagement, it would suggest that higher social risk predicts greater personal relevance of achieving acceptance for HSEs, but predicts lesser personal relevance of achieving acceptance for LSEs. The level of task engagement can then be related to approach-avoidance behavior in risky social situations. Because a high risk social situation is engaging for HSEs, they will actively pursue the goal of achieving acceptance in the social interaction. In contrast, because a high risk social situation is disengaging for LSEs, they will not pursue the goal of achieving acceptance, resulting in passive or inhibited social behavior (e.g., Wood & Forest, 2011). With this interpretation, engagement would replace challenge-threat evaluations in my proposed model. Higher HR reactivity would indicate BAS-engaged and lower HR reactivity would indicate BIS-disengaged.

Future research should try to distinguish a continuous engagement model, as described in the preceding paragraph, from a challenge-threat account. Blascovich and his colleagues' most recent challenge-threat research suggests using more direct and precise cardiovascular measures

than HR, such as cardiac output and total peripheral resistance, to measure challenge-threat activation (e.g., Blascovich et al., 2004; Blascovich & Tomaka, 1996). Because my research was preliminary in its concepts and ideas, I chose to use HR reactivity for a broad, robust measure of challenge-threat evaluations. In future research, more precise cardiovascular measures than HR can lead to stronger claims regarding challenge-threat and can generate new predictions for BAS-BIS and the self-esteem self-regulation system.

Although I make inferences regarding the BIS when interpreting my results, it is possible that my results only reflect variations in BAS activation as a function of self-esteem and social risk condition. My sample had a relatively high self-esteem in an absolute sense (Pilot Study: M =7.33, SD = 1.14; Thesis Study: M =7.53, SD = .94; both on a nine-point scale). Therefore, in the Pilot Study the mean self-esteem level for LSEs was 6.19 and the mean self-esteem level for HSEs was 8.47 (i.e., one standard deviation below and one standard deviation above the mean, respectively). In the Thesis Study, the mean self-esteem level for LSEs was 6.59 and the mean self-esteem level for HSEs was 8.47. Low self-esteem participants in this study actually had moderate-to-high self-esteem in an absolute sense. Thus, when evaluating HR reactivity differences between LSEs and HSEs, I was evaluating differences between moderately high self-esteem individuals and very high self-esteem individuals. Therefore, it is possible that both groups favour BAS activation, and my results reflect differential activation of BAS, not a difference between BAS and BIS.

However, this is only a plausible alternative if the range of self-esteem scores I obtained in my research differs significantly from the range of self-esteem scores typically obtained in other research. Although self-esteem in my sample was positively skewed, this is normative for the variable (e.g., Baumeister, Tice, & Hutton, 1989). In other words, people tend to rate

themselves above the absolute average on self-esteem scales, due to self-presentation and social desirability motivations (Baumeister et al., 1989). Lower self-esteem scores in previous research usually reflect moderate or neutral responses to items on an absolute level (Baumeister et al., 1989). There are cultural reasons for this bias, in that Western cultures tend to have higher self-esteem than East Asian cultures (e.g., Tafarodi et al., 1999). Because Western cultures value self-esteem more than East Asian cultures, Western cultures' higher self-esteem levels may reflect the Western tendency to self-enhance culturally-important traits, rather than actual self-esteem differences (e.g., Falk, Heine, Yuki, & Takemura, 2009). Moreover, most self-esteem research samples undergraduate university students, and university students usually have higher socioeconomic status, which is positively correlated with self-esteem (Twenge& Campbell, 2002). Therefore, the self-esteem levels observed in my samples may be consistent with cultural norms.

As well, my samples comprised male participants, and men tend to have higher global self-esteem than women (Kling, Hyde, Showers, & Buswell, 1999). For example, when I looked at male sample-means for the studies reported in Cameron et al. (2010) and Kling et al., (1999), means ranged from 6.95 to 7.56,[3] which is a range consistent with the scores I obtained in my own sample. In addition, the original studies that reported associations between self-esteem and BIS activation also had positively skewed samples on self-esteem (e.g., mean self-esteem ranged from 7.22 to 7.31[4] in Heimpel et al., 2006), as did the samples used to demonstrate that threat evaluations are associated with self-esteem (e.g., mean self-esteem ranged from 7.13 to 7.49[5] in Seery et al., 2004). Therefore, "lower self-esteem" does not refer to "low" in the absolute sense

[3]These data from the Rosenberg Self-Esteem Scale (1965) were transformed to match the 9-point format that I used for the present studies, rather than the original 4-point response format.
[4] Ibid
[5] Ibid

of scoring low on the nine-point Rosenberg (1965) scale. Researchers usually define "low self-esteem" relatively based on sample distributions, as I did in the present research. Though the LSEs in my sample had a mean self-esteem that was moderately high in absolute terms, this sample mean for LSEs was well within the range of means for LSEs in previous studies regarding self-esteem, challenge-threat, and BAS-BIS. Thus, based on these arguments, the LSEs in my sample likely did have both BIS and threat activated by social risk. Therefore, it is justifiable to make claims regarding both BAS and BIS from my results. My results suggest that BAS-challenge activation occurs for HSEs in risky social situations, whereas BIS-threat activation occurs for LSEs in risky social situations. In future research, I can validate these BIS-threat assertions by measuring skin conductance and blood pressure. Increased skin conductance indicates BIS activation (e.g., Fowles, 1980, 1988), and increased blood pressure indicates threat appraisals (e.g., Tomaka et al., 1993). Finally, I can use Carver and White's (1994) BAS-BIS self-report scales to validate my claim that both BAS and BIS are being activated as a function of self-esteem and social risk.

Nevertheless, replication of the present research using a sample with absolutely lower self-esteem could lead to a more comprehensive understanding of my proposed mechanisms behind the social regulatory function of self-esteem. Future research could use community samples of participants instead of undergraduate students. The results from this lower self-esteem sample should further support my claims regarding BIS-threat activation, because I predict that absolute LSEs (i.e., individuals scoring at the lower end of the self-esteem scale) will have significantly more BIS-threat activation than absolute HSEs (i.e., individuals scoring at the higher end of the self-esteem scale) in socially risky situations. I predict that samples of participants with wider ranges of self-esteem scores will yield similar results to those I obtained,

but with more extreme self-esteem effects. With a larger sample of absolute LSEs, in a low social risk condition there may even be a cross-over effect such that LSEs demonstrate higher HR reactivity than HSEs, a result consistent with motivational research (e.g., Cavallo et al., 2012). As well, future studies can specifically sample absolute LSEs to participate, perhaps by using large-scale surveys to identify desired participants prior to sampling. However, absolute low self-esteem may reflect depression or clinical levels of anxiety (e.g., Orth, Robins, Trzesniewski, Maes, & Schmitt, 2009; Sowislo & Orth, 2013). Clinical samples may respond differently to social risk than non-clinical samples (e.g., samples used in previous self-esteem research). Those with clinical depression and clinical anxiety may have BIS-sensitivity, a chronic tendency to activate the BIS, whereas non-clinical samples may have BAS or BIS activateddepending on their cognitive appraisals. Thus, in a high social risk situation, clinical samples would likely have the same BIS-threat activation as non-clinical LSEs. *However,* in a low social risk situation, the clinical samples would still have high BIS activation due to their BIS-sensitivity, whereas non-clinical LSEs would not have BIS activation due to no threat appraisals. Additional studies can test these proposals.

Limitations and Future Research

One limitation of the present research is that the Thesis Study used two different research assistants to speed up data collection. This introduces potential researcher differences. It is essentially impossible (and unethical) to make sure the researchers were equal in physical attractiveness and other traits that may affect the participants' responses to the research measures. As well, one researcher ran 37 participants and the other ran 27, potentially skewing the results if there were any significant differences between the researchers. I did run an analysis that controlled for researcher effects, finding no significant differences.

Participants in my study were single, heterosexual men. I restricted the study to males to eliminate the need to over-sample to account for possible gender effects. I predict that the same results would occur if I ran the study with female participants, but future researchers should test this possibility.

I recruited single participants because I was interested in a relationship-initiation context. In addition, an interaction with an opposite-sex participant is probably more socially risky than an interaction with a same-sex participant. What do I expect would occur if I replicated the present research but sampled participants in romantic relationships already? There are two possibilities. If the participant is in a casual relationship and/or has a significant inclination to cheat on his romantic partner, I expect results to be identical to the present results. If the participant is in a serious relationship and has no doubts about his loyalty to his partner, he would have less interest in forming a romantic relationship with the interaction partner, which would decrease social risk. Thus, for serious relationship participants, the higher social risk condition might not be risky enough to prompt self-esteem differences in HR reactivity. Future research should examine these possibilities. This research should also be replicated with homosexual participants and same-sex interaction partners.

Another limitation is the data-analysis approach I used. For both the Pilot Study and the Thesis Study, I used the variable of HR reactivity, the difference between baseline and maximum HR achieved in the target study period. This method was used in extant research published in respected peer-reviewed journals (e.g., Cleveland et al., 2012). But this method is imprecise, focusing on one moment within a broad experimental context. When exploring my data, I examined self-esteem by social risk interactions predicting HR range, mean HR, and max HR.In the Thesis Study, I examined these variables and HR reactivity in various stages of the

experimental session (e.g., during social risk manipulation, during filming of the video, during the surveys). The pattern of results was consistent across all of these dependent variables, but results were clearest and strongest using the methods I reported. The interaction between self-esteem and social risk may have been the most pronounced during the filming of the video because that moment was closest to an actual social interaction; social risk would have been highest at that moment. Future analyses of my data and future researchers' data can explore HR reactivity, max HR, or HR range at different points in the video. Perhaps at the onset of the video, all participants are extremely nervous and likely have a higher HR, but the social risk manipulation's differences would only be apparent after this onset period.

Multilevel modelling is another way to analyze my data for future examinations. HR was continuously sampled throughout the study for all participants, meaning that there were multiple measures for each participant. With multilevel analysis, one can examine changes in HR responses throughout the study and in response to specific stimuli timelines for each participant. One could then examine whether a person-level variable like global self-esteem predicts individual patterns of physiological responses. Using this method, I predict that the HR pattern will fluctuate significantly more for HSEs than LSEs in a risky social situation due to activation of challenge and BAS for HSEs. Conversely, there should be no self-esteem differences in HR pattern in low social risk situations.

Conclusions

Social situations often have an element of social risk and ambiguity. Todd's and Steve's social gathering, described at the start of this thesis, is a commonly-experienced social situation. Understanding the social self-regulation system of self-esteem and consequently devising a more comprehensive model such as the one proposed in this research can helppsychologists

understand the processes behind behavior and cognitions, like those of Todd and Steve, in situations with social risk. My results show that the self-esteem differences in social situations do not stem from a difference in social abilities but from differences in cognitive appraisals and perceptions of the situations. Self-esteem and social risk interact to influence physiological responses, providing evidence that self-esteem is closely related to more primal systems such as challenge-threat and BAS-BIS. By connecting social motivations with challenge-threat and cost-reward paradigms, I explain the mechanisms underlying the links among self-esteem, social risk, and approach-avoidance motivations. My results mark the first exploration into the underlying physiological mechanisms in the self-esteem regulation system. I hope future researchers will continue to examine this important topic.

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Appendix A

Information Letter and Consent Form - Constrained Communication Study

Student Investigator: Eric Huang, stinsonlabuvic@gmail.com
Faculty Advisor: Dr. Danu Stinson, Department of Psychology, dstinson@uvic.ca

You are invited to participate in a study entitled "Constrained Communication Study" that is being conducted by Dr. Danu Stinson, a faculty member in the Department of Psychology at the University of Victoria. You may contact her if you have further questions by using the contact information provided above. This research is being funded by the Social Sciences and Humanities Council of Canada.

This study is designed to investigate compatibility in constrained communication between male and female strangers in a first interaction situation. What is meant by constrained communication is that strangers will not be in the same room, but will instead have a restricted interaction via webcam, connected to another computer on the internal network and password protected for security. During the study, a small portable device will record your heart rate and throughout the session. First, you will complete two preliminary surveys about yourself (i.e. your demographic information, personality characteristics, and activity preferences). You will then have a restricted interaction with another participant via webcam. In this interaction, you will create a brief (approximately 2 minute) video message for the other participant. The other participant will watch your message and then film a response, which you will watch. To make the communication constrained, you will not be able to view or hear your interaction partner as you are making your video, and your interaction partner will not be able to view or hear you as s/he is making her/his video. You will complete a short survey about your impressions of the interaction, and then film a final response to the other participant.

This study will take approximately 90 minutes of your time. In appreciation for your time you will receive experimental course credit and may choose to receive candy. Although you may be known to be a study participant by the researcher, your confidentiality and the confidentiality of the data will be protected: Your name will not be associated with your data in any way, and your data will be stored inside password protected computers in a secure area of the psychology building. The researchers will not indicate your name or other identifying information on your surveys. Your surveys and videotapes will be identified by a number and this number will not be connected to your name in any manner.Your survey responses will not be shared with the other participants. As a participant in this study, you should be aware of the possible risks of participation. Although anticipated risks are minimal, it is possible that participation may cause some participants to experience temporary feelings of discomfort. The anticipated benefit to you is that you may experience and learn more about how psychological research is conducted. If you would like results of the study, an aggregated summary can be provided by email once it is ready. This summary will not contain information about how particular individuals scored but will represent an aggregation of results across all participants.

It is anticipated that the results of this study will be shared with others (in aggregated form) in the following ways: Scholarly journals or books, presentations at scholarly meetings,

the internet, and the media. Data from this study will be disposed of by shredding paper records or deleting data files five years after publication.

You may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca). Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

With full knowledge of the abovementioned information, I hereby agree to participate in this study.

Participant Name

_____ _____

Signature of Participant Date

Appendix B

Researcher Script

[Prepare all materials and computer components before the start of each testing period, including turning on the computer and logging in. Wet the heart rate strap under the sink in the washroom and then dry it briefly with a paper towel. It should still be a little damp. Connect the heart rate monitor to the strap, with the correct side up and the clip to the left. As well, note anything out of the ordinary if it occurs during the session.]

[When you meet with each participant at the washroom area beside the sign]

"Hi, I am _____ (research assistant's name) and I will be conducting this study. Thanks for coming. We really appreciate your participation. Before we begin, please turn off your cell phone. We're now going to walk to the testing room.

[Turn over "Experiment in Session" sign]

Right now I am going to give you a consent form. Please read it through carefully. If you decide to continue in the study, please sign the consent section [give them the **Information Letter and Consent Form**]. If you have any questions, feel free to ask them."

[Hand out consent form]

[While the participant is reading the form, turn on the machine and open LabScribe 2. Make sure everything else is prepared]

"Do you have any questions?"

[Let them make their decision about consent.] [After participant has signed the consent form, collect the consent form; the study will continue as follows.]

Before we start, I'm going to request that you wash your hands and under the chest bone area thoroughly with water only, and make sure to dry those areas well. This will help increase the accuracy of the measures we will use today. You can do this at the washroom at the end of the hall. Please return promptly.

[After the participant returns.]

"First, I am going to ask you to put this heart rate monitor around your chest, so that it's touching your skin just underneath the center bone of your chest. Make sure the strap is hooked at the end like this."

[Show them how to do it easily and how to adjust the straps]
"I'm going to make sure it's on correctly."

[Check it]

"I will attach this device to your fingers. These devices will measure your heart rate and the amount that you sweat. They won't harm you in any way! Please do not play with them or remove them during the study. I will take them off at the end of the study."

[Make sure to gel the fingers first. Attach device snugly to the left hand, with the white connector on the middle finger and the brown on the index finger, answer any questions the P might have]

"Are they on comfortably? Please make sure to keep close to this sensor (less than two feet) for the entire duration that you have on the heart rate monitor for accuracy purposes."
"Now, we will have a five minute period to get you to habituate to the attached equipment."

[Start recording on LabScribe 2 and make sure the equipment is registering. Then wait five minutes before continuing. If it's not registering properly, fix it and then restart.]

[register MARK A on LabScribe 2]

"Now, I would like you to fill out this preliminary survey.

[Open the preliminary survey on the laptop by copying-and-pasting the link from the text file. Put the participant number in the form of "PF12001M" (meaning Participant, Fall Session, 2012, #001, Male). Give the following instructions.]

"Please answer the following questions as honestly as possible. If you're not sure what the best answer is for you, try to come as close as you can. **Please read the instructions carefully.**
If you have any questions, please ring this bell a few times. I have to periodically check with the other participant in the room down the hall as well. Please stay seated here, as you are connected to this equipment.

When you're done, please let me know you're finished by ringing the bell a few times."

[MARK B – before leaving the room]

[When the participant is finished]

[MARK C]
"Thanks"

If participant is in the **Expectancy condition** (if not, skip this)**:**
"Next you are going to do another survey, then for the next task, you are going to make a two-minute video for your assigned partner in the other room. You've been randomly selected to make the first video. This video is a live feed; that means that as we are recording your message your assigned partner will be able to view a live stream of your video message. Then the other participant will make a video for you that you will watch. Sometimes participants wonder if they will get to meet their interaction partner face to face, after making these videos. The good news is that you two *can* meet each other face to face, but only if the other participant decides that she wants to meet you. So after watching each others' videos, I'll ask the other participant if she is interested in meeting you face-to-face. If she says yes, I'll bring her to this room and you can meet. If she says no, then that will be the end of the study."

If participant is in the **No Expectancy Condition** (if not, skip this)**:**
"Next you are going to do another survey, then for the next task, you are going to make a two-minute video for your assigned partner in the other room. You've been randomly selected to make the first video. This video is a live feed; that means that as we are recording your message your assigned partner will be able to view a live stream of your video message. Then the other participant will make a video for you that you will watch. Sometimes participants wonder if they will get to meet their interaction partner face-to-face, after making these videos. Regulations for running studies here actually mean that I can't let you meet face-to-face, so there isn't any possibility of meeting the other participant, even if you wanted to. Watching each other's videos will be the only contact that you have with each other."

[MARK D]

[Paste in the Survey 2 link, start the survey, and type in the participant ID]

"Please answer the following questions as honestly as possible. If you're not sure what the best answer is for you, try to come as close as you can. **Please read the instructions carefully**
If you have any questions, please ring this bell a few times. Again, I have to periodically check with the other participant in the room down the hall as well. Please stay seated here, as you are connected to this equipment.

When you're done, please let me know you're finished by ringing the bell a few times."

[MARK E – before experimenter leaves]

[When the participant is done the survey]
[MARK F]

“Thanks”

[Exit the survey window. Minimize all windows.]

[Video part]

“You are now going to make a video for the other participant. You’ve been randomly assigned to make the first video. Remember that it is a live streaming feed.”

For all participants:
“When you finish making your videotaped message for the other participant, please ring the bell, and I’ll come in and stop the tape. Once I turn on the camera, leave the room, and shut the door, you may begin. In total, the videotaping usually takes about 2 minutes, but the important thing is to make sure that you answer all of the questions on the topic sheet. I’ll give you the topic sheet and let you think about what you’ll say. I’ll be back in a minute before we begin taping.”

[Give the participant the topic sheet. Leave for 1 minute.]

“Okay, let’s get you started. And please remember that it is very important that you talk about all seven questions on the topic sheet. Feel free to look at the topic sheet to make sure that you have answered all of the questions.So if you have any questions, ring the bell. Once you’ve finished, ring the bell.”

[Turn on the camcorder.]

[MARK G – Minimize all windows]

[Leave the room and wait till they have rung the bell. This should take them no longer than 4 minutes. If it’s taking longer, knock on the door and check on them].

[Once the participant has rung the bell, continue with the script].

[MARK H]

“Okay, you’re finished? Let me just turn off the camcorder. Now you will complete another survey.

[Open the Survey 3 and put in participant number.]
"For this survey, please read all the questions carefully, and answer as honestly as possible. If you have any questions, please ring the bell and I will return to the room. When you're done with the survey, just ring the bell.

[MARK I]

[When participant rings bell, continue]

"Great, thanks. I'm going to disconnect the physiological measures.

[Disconnect measures. Save the LabScribe file as the participant number in the correct folder.]

"Now, before we continue I would like to ask you a couple of questions.

[Read the questions on the record sheet and record their answers on there]

"Okay, thanks. Now to finish our session today I am going to tell you a bit more about the study. **Expectancy:** I know you expected to have an opportunity to meet the other participant today but that is not possible and I'll explain that shortly.

Debriefing Script
"We would like to take this opportunity to thank you for your participation in this study. We truly appreciate your taking the time to help us with this research.

"When you first arrived here today, you were told that this study was designed to investigate first meeting situations. Although we were indeed interested in studying first meeting situations, the study was of a different nature than we originally explained to you.

"There was another component to this study: participants were randomly assigned to either be told that they would meet the other participant face-to-face later in the session or that they could not meet the other participant in the session. In reality, because there was no other participant present, no second meeting was ever possible for any participant. We hope that once we explain the purposes of the present research, it will be clear why we could not be totally forthcoming about the nature of this study

"We were first interested in whether first meeting situations are associated with physiological arousal. For example, does meeting someone new cause increased heart rate? This is why you wore a heart rate monitor throughout the study. Additionally, we were interested in how

physiological arousal influences peoples' ratings of the costs and benefits of meeting the new person. Finally, we were interested in how personality (specifically self-esteem) plays a role in all of the above.

"Self-esteem is related to people's social thoughts, feelings, and behavior. Individuals with lower self-esteem tend to experience more social anxiety than individuals with higher self-esteem, and this difference is very apparent when the risk of rejection is present. In the present study, we manipulated the risk of rejection. This manipulation was the independent variable. Participants in the "No risk" condition thought that they would never meet their interaction partner face-to-face. Participants in the "Risk" condition thought that they would perhaps meet their interaction partner, if he or she wanted to meet the participant. We expect that when the risk of rejection is present, self-esteem differences in physiological arousal should be clear: Individuals with lower self-esteem will be more aroused than individuals with higher self-esteem. Additionally, we expect that physiological arousal will influence how people think about the rewards, costs, and outcomes in the situation, such that individuals with lower self-esteem will perceive less reward, greater costs, and poorer outcomes when they are aroused because such beliefs are typical for individuals with lower self-esteem; individuals with higher self-esteem will perceive greater reward, lesser cost, and better outcomes when they are aroused, because such beliefs are typical for individuals with higher self-esteem. Finally, we expect that our risk manipulation will affect social behavior. When risk is present, individuals with lower self-esteem tend to restrain their social behaviour, particularly their warmth. However, self-esteem differences in whether people restrain their behaviour is totally dependent on the risk of rejection: Self-esteem differences in social behaviour do not represent differences in social skills or abilities; if the risk of rejection is reduced or eliminated, individuals with lower self-esteem behave just as warmly as individuals with higher self-esteem."

"It's actually very difficult to study these types of hypotheses. One way is to just let two people interact face-to-face. But that introduces a lot of variance into the situation, making it difficult to assess the effects of social risk or self-esteem on arousal and behavior. To have some experimental control in the situation, researchers can make sure that every participant has the same social experience, and that's what we tried to do in this study by having everyone go through the same process.

"We apologize for misinforming you and not being able to disclose all the details of the study before hand. I hope you understand that it was necessary for this research. As you can imagine, if you would not really be talking to someone else, your responses would not have been very realistic."

"Do you have any questions?"

[Answer any questions they may have]
Because some elements of the study are different from what was originally explained, we have another consent form for you to read and sign if you are willing to allow us to use the information that you have provided. This form is a record that the purpose of the study has been explained to you, and that you are willing to allow your information to be included in the study.

[Give participant **Post-Debriefing Consent Form**]

Also, we have some written feedback about the study that you can keep. There's some contact information on it as well, for people you can call if you have any questions or concerns about the study, and we have also included the number for Counseling Services, which you can contact if your participation in this research has raised any issues that you wish to discuss.

[give P **Post-Study Debriefing and Feedback Letter**]

Quotes from participants' written or verbal reports can be useful in illustrating certain points in professional journals or oral reports. All quotes are anonymous and confidential. Any names that you might have spoken or written in your responses will be changed to maintain your anonymity. May we have permission to anonymously quote you in a professional journal or oral report?

[Note if they say no]

Finally, we'd really appreciate it if you would help us out by not telling any other students about what you did in this study today. If people come into the study knowing about our specific predictions, as you can imagine, it would influence their results, and the data we collect would be not be useable. As a way of saying thank you, we'd also like to give you two lollipops…in addition to your experimental credit of course!

[let P choose]

Thanks so much!

[Show participant out]

After the session, make sure to write the participant's ID number on ALL study materials (not including consent forms). Make sure to write the participant condition where listed. Please put all labeled materials in an envelope labeled with the participant's Sona ID, and store all consent forms in a separate folder.

[Wipe down the equipment with wet wipes after. Disconnect the heart rate monitor from the strap. If this is your last participant of the day, turn off the machine, return it to the drawer, lock the drawer, and return the key. Turn over “Experiment in Session” sign. Update SONA by giving the participant credit if he completed the experiment.]

Appendix C

Survey 1

What is your participant ID number? _____
What is your gender? (Male/Female) _____
What is your age? _____
What is your ethnicity? (Aboriginal/First Nations; African/Black; Asian; East Indian; Hispanic, Middle Eastern; Caucasian/White; Not listed)
Were you born in Canada? (Yes/No) _____
Are you currently involved in a serious dating relationship? (Yes/No) _____
If yes how long have you been involved in your current relationship? _____(months)

What is the current status of this relationship? (check all that apply)

Casual dating _____
Dating this person and others _____
Exclusive dating _____
Engaged _____
Married_____
Living together _____
Long distance _____

How do you feel generally? – Rosenberg Self-Esteem Scale (1965)

Think about each statement that follows and rate the degree to which you agree or disagree with it on the following scale.

1	2	3	4	5	6	7	8	9
Very strongly disagree		Moderately disagree		Neutral		Moderately agree		Very strongly agree

a. _____ I feel that I am a person of worth, at least on an equal basis with others.
b. _____ I feel that I have a number of good qualities.
c. _____ All in all I am inclined to feel that I am a failure.
d. _____ I am able to do things as well as most other people.
e. _____ I feel that I do not have much to be proud of.
f. _____ I take a positive attitude toward myself.
g. _____ On the whole I am satisfied with myself.
h. _____ I wish that I could have more respect for myself.
i. _____ I certainly feel useless at times.
j. _____ At times, I think I am no good at all.

Ten Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003)

Below are a number of personality traits that may or may not apply to yourself

Using the following scale, please indicate the extent to which you agree or disagree with each statement. You should rate the extent to which the pair of traits applies to yourself, even if one characteristic applies more strongly than the other.

1	2	3	4	5	6	7	8	9

Very strongly disagree	Moderately disagree	Neutral	Moderately agree	Very strongly agree

I see myself as:

a. Extraverted, enthusiastic_____
b. Critical, quarrelsome_____
c. Dependable, self-disciplined_____
d. Anxious, easily upset_____
e. Open to new experiences_____
f. Reserved, quiet_____
g. Sympathetic, warm_____
h. Disorganized, careless_____
i. Calm, emotionally stable_____
j. Conventional, uncreative_____

Felt Security Assessment (Cameron & Holmes, 2010)

For this section: Write the number that best represent how you truly feel on the line beside each statement. Some questions will ask you about your friends or your family in general. When answering other questions about romantic partners, please think of all steady or serious romantic relationships you have been in. Also, some of the questions may seem similar, but please try to answer each question on an individual basis (i.e., put down your first response and avoid comparing your answers).

1	2	3	4	5	6	7	8	9
Not true at all		Slightly true		Moderately true		Very true		Completely true

1.____ I am worthy of being treated well by my friends.
2.____ I worry that my friends think I'm no good at all.
3.____ I often worry that my friends don't care for me as much as I want them to.
4.____I deserve to be loved by my family members.
5.____I'm afraid that my family thinks of me in a negative way.
6.____I often worry that my family will stop loving me.
7.____When a family member is too busy to spend time with me, I assume that he/she doesn't really care about me.
8.____I am a good enough person to be treated well by my family.
9.____When I am in a steady dating relationship, I often find myself feeling anxious about what my partner might think of me.
10.____When I am dating someone, I know that I deserve to be loved by that person.
11.____When I am in a dating relationship, I'm often afraid that my partner does <u>not</u> really love me.
12.____I am a good enough person to be in a romantic relationship with the person I want to be with.
13.____When I am in a dating relationship, I believe that I am worthy of being treated well by that person.
14.____I'm frightened that my romantic partner might abandon me.

15.____My friends regard me as very important in their lives.
16.____My friends think I have many serious faults.
17.____My friends care about me.
18.____My friends think I have a good personality.
19.____My family members think that I'm a really good person.
20.____My family members love me.
21.____My family members want me to be a part of their lives.
22.____My family members think that I am a valuable person.
23.____When I'm in a romantic relationship, my partner typically believes I have many good qualities.
24.____When I'm dating someone, that person regards me as very important in his/her life.
25._____When I'm in a steady dating relationship, my partner is responsive to my needs.
26.____When I'm romantically involved with someone, my partner typically cares a great deal about me.
27.____When I'm dating someone, my partner typically thinks that I'm a great person.

Perceptions of Social Risk

Please think about your interactions in with new people *in general* and respond to the items using the scale below.

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Extremely

1. I look forward to meeting new people____
2. I worry about what new people think of me___
3. I focus on preventing negative interactions____
4. I focus on achieving positive outcomes in interactions____
5. I focus on getting new people to like me____
6. I do not care if I make new friends ___
7. I look forward to making new friends ___
8. I am afraid of being rejected by new people___
9. I feel good about meeting new people___
10. I am cautious about expressing my opinions to new people___

Appendix D

Survey 2

Positive and Negative Affect Scale (Watson, Clark,& Tellegen, 1988)

This scale consists of a number of words that describe feelings and emotions that you might be experiencing during your participation today. Read each item and then mark the appropriate answer in the space next to that word. Use the following scale to record your answer:

In the study today, I've been feeling . . .

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Very/Extremely

_____interested	_____irritable
_____distressed	_____alert
_____excited	_____ashamed
_____upset	_____inspired
_____strong	_____nervous
_____guilty	_____determined
_____scared	_____attentive
_____hostile	_____jittery
_____enthusiastic	_____active
_____proud	_____afraid

How anxious do you feel about making the videotape for the other participant?

1	2	3	4	5	6	7
Not at all			Somewhat			A great deal

How anxious do you feel about watching the videotape the other participant will make for you?

1	2	3	4	5	6	7
Not at all			Somewhat			A great deal

Please think about your upcoming interaction and respond to the items using the scale below.

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Extremely

1. I am looking forward to meeting my interaction partner____
2. I am worried about what my interaction partner will think of me___
3. I am focused on preventing a negative interaction____
4. I am focused on achieving a positive outcome to the interaction____
5. I am focused on getting my interaction partner to like me____
6. I do not care if I make a new friend today___
7. I am looking forward to making a new friend today___
8. I am afraid of being rejected by my interaction partner___

9. I feel good about meeting my interaction partner___
10. I am cautious about expressing my opinions to my interaction partner___

Approach-Avoidance Scale Items (Andersen, Reznik, & Manzella, 1996)
Please think about your upcoming interaction and respond to the items using the scale below.

1	2	3	4	5	6	7
Not at all						Extremely

1. How much would you want your interaction partner to get to know you as an individual?
2. How much would you want to share your feelings with your interaction partner?
3. How much would you want to tell your interaction partner about your hopes and dreams?
4. How much would you want to tell your interaction partner about your fears and insecurities?
5. How much would you want to avoid being vulnerable with your interaction partner?
6. How much would you want to avoid revealing yourself to your interaction partner?
7. How much would you want to distance yourself emotionally from your interaction partner?
8. How interested do you think you would be in spending time with your interaction partner outside of this context?

9. How much do you think this person will like you?
10. How accepting do you think this person will be of you?
11. How positive do you think this person's impression of you will be?

Appendix E

Introductory Topics for Participants

Instructions:

1. Read the question aloud before answering it.
2. Respond to all of the questions below.
3. You can write brief answers on this sheet before making the video.

The List of Topics to Talk About

(Please allow for enough time to talk about all 7 topics. Remember that your tape should be about 2 minutes long, but please respond to all of the questions.)

1. What is your favorite subject at school?

2. What types of movies are your favorites?

3. What was the last concert you saw?

4. What is your favorite holiday? Why?

5. What is your dream job?

6. How do you usually spend your summers?

7. If you could travel to anywhere in the world, where would you go? Why?

Before finishing your tape, please ensure that you have responded to all 7 questions.

Appendix F

Survey 3

This scale consists of a number of words that describe feelings and emotions that you might be experiencing during your participation today. Read each item and then mark the appropriate answer in the space next to that word. Use the following scale to record your answer:

In the study today, I've been feeling . . .

1	2	3	4	5
Not at all	A little	Moderately	Quite a bit	Extremely

_____interested	_____irritable
_____distressed	_____alert
_____excited	_____ashamed
_____upset	_____inspired
_____strong	_____nervous
_____guilty	_____determined
_____scared	_____attentive
_____hostile	_____jittery
_____enthusiastic	_____active
_____proud	_____afraid

How anxious did you feel making the videotape for the other participant?

1	2	3	4	5	6	7
Not at all			Somewhat			A great deal

What do you think the other participant thinks of you?

1. The other participant probably likes me. (circle one)

1	2	3	4	5	6	7
Completely Disagree			Maybe			Completely Agree

2. The other participant probably wants to meet me.

1	2	3	4	5	6	7
Completely Disagree			Maybe			Completely Agree Agree

3.The other participant probably enjoyed the interaction with me.

1	2	3	4	5	6	7
Completely Disagree			Maybe			Completely Agree

Agree

4. The other participant is probably willing to spend time with me.

1	2	3	4	5	6	7
Completely Disagree			Maybe			Completely Agree

5. The other participant probably wants to have a face-to-face interaction with me.

1	2	3	4	5	6	7
Completely Disagree			Maybe			Completely Agree

6. The other participant probably finds me _____ interesting.

1	2	3	4	5	6	7
Not at all			Somewhat			A great deal

7. The other participant probably thinks that we are _____ similar.

1	2	3	4	5	6	7
Not at all			Somewhat			A great deal

8. The other participant probably finds me_____ attractive.

1	2	3	4	5	6	7
Not at all			Somewhat			A great deal

Appendix G

Debriefing Form

We would like to take this opportunity to thank you for your participation in this study. We truly appreciate your taking the time to help us with this research.

When you first arrived here today, you were told that this study was designed to investigate first meeting situations. Although we were indeed interested in studying first meeting situations, the study was of a different nature than we originally explained to you.

In this study, you were either told that you could potentially meet the other participant or not. Participants were randomly assigned to either be told that they would meet the other participant face-to-face later in the session or that they could not meet the other participant in the session. In reality, because there was no other participant present, no second meeting was ever possible for any participant. We hope that once we explain the purposes of the present research, it will be clear why we could not be totally forthcoming about the nature of this study

We were first interested in whether first meeting situations are associated with physiological arousal. For example, does meeting someone new cause increased heart rate? This is why you wore a heart rate monitor throughout the study. Additionally, we were interested in how physiological arousal influences peoples' ratings of the costs and benefits of meeting the new person. Finally, we were interested in how personality (specifically self-esteem) plays a role in all of the above.

Self-esteem is related to people's social thoughts, feelings, and behavior. Individuals with lower self-esteem tend to experience more social anxiety than individuals with higher self-esteem, and this difference is very apparent when the risk of rejection is present. In the present study, we manipulated the risk of rejection. This manipulation was the independent variable. Participants in the "No risk" condition thought that they would never meet their interaction partner face-to-face. Participants in the "Risk" condition thought that they would perhaps meet their interaction partner, if he or she wanted to meet the participant. We expect that when the risk of rejection is present, self-esteem differences in physiological arousal should be clear: Individuals with lower self-esteem will be more aroused than individuals with higher self-esteem. Additionally, we expect that physiological arousal will influence how people think about the rewards, costs, and outcomes in the situation, such that individuals with lower self-esteem will perceive less reward, greater costs, and poorer outcomes when they are aroused because such beliefs are typical for individuals with lower self-esteem; individuals with higher self-esteem will perceive greater reward, lesser cost, and better outcomes when they are aroused, because such beliefs are typical for individuals with higher self-esteem. Finally, we expect that our risk manipulation will affect social behavior. When risk is present, individuals with lower self-esteem tend to restrain their social behaviour, particularly their warmth. However, self-esteem differences in whether people restrain their behaviour is totally dependent on the risk of rejection: Self-esteem differences in social behaviour do not represent differences in social skills or abilities; if the risk of rejection is reduced or eliminated, individuals with lower self-esteem behave just as warmly as individuals with higher self-esteem.

It's actually very difficult to study these types of hypotheses. One way is to just let two people interact face-to-face. But that introduces a lot of variance into the situation, making it difficult to assess the effects of social risk or self-esteem on arousal and behavior. To have some experimental control in the situation, researchers can make sure that every participant has the same social experience, and that's what we tried to do in this study by having everyone experience almost the same situation.

We apologize for misinforming you and not being able to disclose all the details of the study before hand. I hope you understand that it was necessary for this research. As you can imagine, if you knew that there was no other participant, your responses would not have been very realistic..

If you have any comments or questions about this study, you may contact stinsonalabuvic@gmail.com or Dr. Danu Stinson at dstinson@uvic.ca.

If participation in this study raised any issues you would like to discuss, you may contact the UVic Counseling office (phone #:250-721-8341, email: counsell@uvic.ca) or visit them in person at the University Center, room B202 (located on Ring Road at the University of Victoria). You may also contact UVic Human Research Ethics (phone #: 250-472-4545, email: ethics@uvic.ca) if you have concerns about this study.

If you would like further information about research related to the present study, please refer to:

Ickes, W. (1993). Empathic accuracy. *Journal of Personality, 61*, 587-610.

Cameron, J.J., Stinson, D.A., Gaetz, R., & Balchen, S. (2010). Acceptance is in the eye of the beholder: Self-esteem and motivated perceptions of acceptance from the opposite sex. *Journal of Personality and Social Psychology, 99*, 513-529.

Appendix H

Post-Debriefing Consent Form

Project Title: Constrained Communications Study
Faculty Advisor: Dr. Danu Stinson, Department of Psychology, dstinson@uvic.ca
Student Investigator: Eric Huang, Department of Psychology, stinsonlabuvic@gmail.com

During the debriefing session, it was explained to me why it was necessary for the researchers to use deception in this study. I was informed that having full information on the purpose of the study might have influenced my behaviour and/or responses, and invalidated the results of the study. For this reason, the purpose of the study that I was initially provided was a misrepresentation of the study's true purpose.

I have now received a thorough verbal and written explanation as to the study's true purpose. I have also had the opportunity to ask any questions about this study, and to have these questions answered to my satisfaction.

I give permission to the researchers to use my data in their study, and I hereby agree to this request. I realize that I may withdraw my consent at any time by notifying the Principal Investigator that I wish to do so.

I give permission to the researchers to use my video data confidentially for analysis by trained research assistants.

I give permission to the researchers to use any written or verbal quotes stated during this study anonymously and confidentially.

I am aware that if I have any comments or concerns pertaining to my participation in this study, I may contact the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Participant Name

_____ _____

Signature of Participant Date

_____ _____

Signature of Witness Date