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The tell-tale heart: Self-esteem, arousal, and relationship initiation

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Abstract

Drawing upon risk-regulation theory and classic theories of interpersonal attraction, two experiments (N = 117 and N = 401) tested the hypothesis that self-esteem and arousal interact to regulate the desire to connect with new social partners. A mini-meta-analysis confirmed that when arousal (or its influence) was stronger, self-esteem was strongly and positively associated with connection motivation (d = .53), but when arousal (or its influence) was weaker, self-esteem was unrelated to connection motivation (d = −.05). Furthermore, stronger (vs weaker) arousal decreased lower self-esteem individuals' connection motivation (d = -.23) but increased higher self-esteem individuals' connection motivation (d = .36). These results suggest that self-esteem is an important moderator of the link between arousal and social motivation.

Keywords: self-esteem, social risk, relationship initiation, attraction, self-regulation

The Tell-Tale Heart:
Self-Esteem, Arousal, and Relationship Initiation

"There is no potential for permanence, Master Snickup told his heart,
without the fear of threat."
- *Master Snickup's Cloak* (Theroux, 1979)

Master Snickup is the title character in a bizarre children's book that relates his life as a medieval street urchin. As he contemplates his loneliness, Master Snickup counsels his heart about the truth of relationship initiation, as quoted above: There is no way to obtain social rewards like felt security and belonging without also accepting the threat of negative emotions and rejection. Therefore, Master Snickup has a decision to make. Will he pursue his heart's desire for social connection, or will he withdraw to protect himself from the possibility of social pain? We report two experiments that seek to help answer this question by examining how self-esteem and arousal interact to regulate people's desire to connect with new social partners.

Self-Esteem and Signature Social Motivation

Interpersonal risk-regulation theory (e.g., Murray & Holmes, 2011) suggests that the self-esteem system helps people to resolve the kind of initiation dilemma that Master Snickup is experiencing. Self-esteem reflects a person's perceived value as a relational partner, and this important aspect of the self serves a social regulatory function (Leary & Baumeister, 2000; Stinson et al., 2010). Among other functions, the self-esteem system determines people's response to socially risky situations that afford both rewards and costs. Coping with social risk is a complex balance. Risky situations provoke a motivational conflict between the desire to connect with others to gain social rewards, like belonging, and the desire to protect the self from social costs, like rejection. Resolving this conflict involves prioritizing one goal over the other, but goal choice is not haphazard: People display *signature social motivation,* characteristic

motivational responses to social risk that are evident across social contexts and interaction partners.

In risky interpersonal contexts, lower self-esteem individuals' (LSEs) signature social motivation can be characterized as a form of defensive withdrawal that focuses on protecting the self from social costs. In contrast, higher self-esteem individuals' (HSEs) signature social motivation can be characterized as a form of reactive promotion motivation (e.g., McGregor et al., 2007) that focuses on zealously seeking social rewards (e.g., Anthony, Wood, & Holmes, 2007; Cavallo et al., 2012; DeHart et al., 2003; Gaucher et al., 2012). These signature self-esteem differences are particularly evident when it comes to the desire to connect with, and become closer to, new social partners during relationship initiation. For example, LSEs express cautious, passive, and inhibited interpersonal behavior during relationship initiation, whereas HSEs adopt a bold, active, and expressive style of initiation (e.g., Cameron et al., 2010; Cameron et al., 2013; Stinson, Cameron, Hoplock, & Hole, 2015; Stinson, Cameron, & Robinson, 2015). In turn, signature social motivation predicts people's social well-being. Whereas HSEs' expressive interpersonal behavior is attractive to new social partners, LSEs' defensive withdrawal, particularly their inhibited warmth and lack of self-disclosure, predicts disinterest from new interaction partners. Thus, LSEs' doubts about their self-worth can prompt a self-fulfilling prophecy, whereby their social doubts lead to social withdrawal, which in turn erodes the quality of their social bonds, thereby affirming their poor self-worth (and of course, HSEs can experience the opposite).

Given the large body of evidence demonstrating that self-esteem differences in signature social motivation predict well-being, theoretically and empirically unpacking the associations among self-esteem, social risk, and connection motivation could have meaningful implications

for understanding self-esteem differences in quality of social bonds, and by extension, understanding self-esteem differences in health and well-being (e.g., Stinson & Swann, 2017; Stinson et al., 2008). The present research pursues this goal by examining whether self-esteem moderates the link between arousal and the desire to connect with new social partners during relationship initiation. Our results could make important contributions to theories concerning the arousal-attraction link and the self, and may also suggest avenues for simple interventions aimed at improving LSEs' social well-being.

Self-Esteem, Arousal, and Social Motivation

Psychologists have long known that generalized physiological arousal plays an important role in motivation and emotion. Schachter and Singer's (1962) two-factor model of emotion proposed that people's experiences of joy, or anger, or anxiety result from context-generated labels applied to feelings of generalized physiological arousal. Indeed, Berscheid and Hatfield (1974) suggested that romantic love occurs when people experience arousal in the presence of a desirable partner. Moreover, classic attraction research revealed that physiological arousal induced by exercise or intense emotions like fear can increase desire for an attractive potential partner (e.g., Dutton & Aron, 1974). In subsequent decades, researchers proposed and tested various explanations for this arousal-attraction link, eventually settling on a dual process model (Foster et al., 1998). Per this model, arousal can influence social motivation via uncontrolled processes, as when exercise or intense emotions facilitate people's dominant interpersonal responses, thus increasing desire for an attractive partner but decreasing desire for an unattractive partner. Yet even though arousal generally influences social motivation via uncontrolled, impulsive processes, it is still possible for controlled processes to adjust such impulses. For example, if arousal is not attributed to a particular goal-relevant object (or person) and is

attributed to another source instead, then such *misattribution of arousal* can eliminate the effect of arousal on behavior (e.g., Savitsky et al., 1998).

Thus, in the current research we adapt and apply the dual process model of arousal and attraction to help explicate self-esteem differences in signature social motivation during relationship initiation. First, based on uncontrolled, response-facilitation processes, we propose that heightened arousal will exaggerate self-esteem differences in signature social motivation during relationship initiation. Second, because people are able to adjust their impulsive responses to arousal, we also predict that providing people with an alternative attribution for their arousal during relationship initiation should reduce or eliminate self-esteem differences in signature social motivation.

We test these proposals in two experiments. In our first experiment, we manipulate female participants' physiological arousal with exercise and then observe self-esteem differences in their desire to connect with a new male acquaintance. Compared to a no-exercise control condition, we predict that exercise will exaggerate signature self-esteem differences in the desire to connect with their new acquaintance. Put another way, we predict that the positive association between self-esteem and connection motivation will be stronger in the exercise condition than in the no-exercise condition (H1). In our second experiment, we manipulate participants' attributions for their emotional arousal – which is either naturally occurring or experimentally-heightened – as they contemplate joining a new social group. Compared to the no-attribution control condition, we predict that providing participants with an alternative attribution for their arousal will reduce or eliminate signature self-esteem differences in their willingness to join the new social group. Put another way, we anticipate that the positive association between self-esteem and connection motivation will be greater in the no-attribution condition than in the attribution condition (H2).

In both studies, we will also explore whether the anticipated condition differences are driven by changes in connection motivation for LSEs, HSEs, or both groups, but we do not have specific predictions in this regard (prior risk-regulation research suggests all three options are possible).

Prior research has identified a host of moderators of the link between arousal and social motivation, including arousal source ambiguity, the interaction partner's physical attractiveness, the type of arousal (e.g., negative emotion vs exercise vs sexual excitation), and the genders of the interaction partners (e.g., male-male vs male-female; Foster et al., 1998). Examining each of these moderators has helped to elucidate the exact nature and function of the link between arousal and social motivation. Yet to date, researchers have not examined how personality or other important aspects of the self, like self-esteem, might moderate the link between arousal and social motivation, an enterprise that could be equally informative. In particular, if self-esteem moderates the link between arousal and the desire to connect with new social partners, as we propose, then it will provide additional evidence that the self-esteem system likely functions, in part, by building upon more primal psychobiological systems that utilize arousal to regulate generalized appetitive and aversive motivation (e.g., Gray, 1990). Thus, by bringing together risk-regulation theory with classic theories of arousal and attraction, our research has the potential to make novel theoretical contributions to multiple psychological literatures.

Experiment 1

In our first experiment, we manipulate physiological arousal and then observe its effect on participants' desire to connect with a new acquaintance as a function of self-esteem. To achieve this goal, we use a realistic and well-validated experimental paradigm for studying relationship initiation, in which participants have the opportunity to interact via video-camera with another participant in an adjacent lab room (see Cameron et al., 2010; Stinson, Cameron,

Hoplock, & Hole, 2015). In this case, we invited romantically-single, heterosexual, female participants to interact with a romantically-single male participant (actually a confederate), and although the social context is not explicitly romantic and it is heterosexist to assume that interactions between single men and women are inherently romantic, we thought that the cross-gender context and its associated social scripts might increase the consequentiality of the situation for participants. Against this social backdrop, we manipulate arousal: participants in the experimental condition engage in strenuous exercise for two minutes. We predict that arousal will strengthen participants' signature social motivation (i.e., their dominant response), thus exaggerating self-esteem differences in connection motivation relative to the control condition. Put another way, we predict that the positive association between self-esteem and connection motivation will be stronger in the exercise condition than in the no-exercise condition (H1). We also explore whether the predicted condition difference is driven by decreases in LSEs' connection motivation, increases in HSEs' connection motivation, or changes among both groups.

Method

Additional measures, methodological details (e.g., scripts), and analysis code are posted in the online supplemental materials (OSM): https://osf.io/5c2y6/ Because this research was conducted before data-sharing became common practice in psychology, we did not obtain consent from participants to share their data with other researchers. For similar reasons, the research was not pre-registered. This research received approval from the Human Research Ethics Office at the University of Victoria (approval number: 11-347).

Participants

Within the two semesters that we allotted to collect data, we were able to recruit 117 female, heterosexual, romantically-single participants (M_{age} = 19.44, SD_{age} = 1.84 years; 1 Aboriginal/First Nations, 4 African-Canadian/Black, 8 Asian, 9 East Indian, 1 Hispanic, 3 Middle Eastern, 88 White, 3 mixed race/ethnicity).[1] Participants received partial course credit and a chocolate bar or pen in appreciation for their time.

Sensitivity analyses using G*Power (Faul et al., 2017) indicated that with this sample size, 80% power, and α = .05, we could detect a population f^2 of .07 for the hypothesized Self-Esteem X Condition ordinal interaction.

Procedure

At individual lab sessions, the female experimenter helped participants to adorn a wrist-watch style heart-rate monitor. Next, participants who were randomly assigned to the *no-exercise condition* completed a preliminary survey that assessed self-esteem, demographics, and filler items. Then participants were informed that there was a male participant in the adjacent lab room (i.e., the *partner*), and the participants and their partner would be communicating with one another via video camera. Then the experimenter photographed the participants and showed participants a digital photograph of their supposed interaction partner: A moderately-attractive white man in his early 20s (49 women evaluated his attractiveness using a 7-point scale, *M* = 4.47, *SD* = 1.02). Using a moderately-attractive confederate allowed us to avoid the possible ceiling or floor effects that could occur if we used a photo of a very attractive or unattractive man. Note as well that it is virtually impossible that any participants knew the model as he attended a university in a province across the country a decade before this study was conducted. Next, participants completed a second survey assessing their desire to connect with their new

acquaintance and filler measures. Finally, participants were debriefed concerning the true purposes of the study.

Participants who were randomly assigned to the *exercise condition* used an aerobic step for two minutes immediately after the preliminary survey. All of the remaining procedures were identical to the no-exercise condition.

Measures

Self-Esteem. Participants completed Rosenberg's (1965) Self-Esteem Inventory, adapted to a 9-point format from the original 4-point format (1 = *very strongly disagree;* 9 = *very strongly agree*; α = .88).

Heart Rate. The experimenter recorded participants' *baseline heart rate* after they completed the initial questionnaire, and recorded the *post-exercise heart rate* for participants in the exercise condition.

Connection Motivation. Participants used a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*) to report their intended expressivity on eight items tapping their willingness to open up and reveal themselves to their interaction partner (e.g., "I would like to tell my interaction partner about my hopes and dreams;" derived from Gaucher et al., 2012). Intended expressivity is a validated indicator of connection motivation that is responsive to self-esteem differences in signature social motivation (Gaucher et al., 2012). Negatively-phrased items were reverse-coded, and then the items were aggregated (α = .71; *M* = 3.02, *SD* = 0.76).

Results and Discussion

Preliminary analyses indicated that none of the results we report below are moderated by participants' race/ethnicity.

Participants' baseline heart rate was in the normal resting range ($M = 88.14$, $SD = 23.36$) and did not vary as a function of self-esteem. In addition, exercise substantially increased experimental participants' heart rates ($M = 148.80$, $SD = 19.17$; $d = 2.82$).
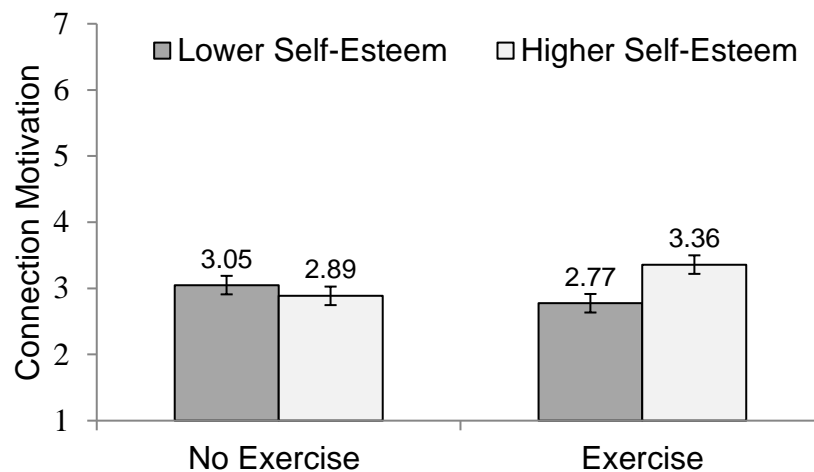
We regressed participants' connection motivation onto: Step 1) mean-centered self-esteem ($M = 6.76$, $SD = 1.31$), dummy-coded condition (no-exercise = 0, exercise = 1); and Step 2) the interaction between variables. Results revealed the expected interaction (see Table 1 and Figure 1). To test our first confirmatory hypothesis, we followed the procedures recommended by Aiken and West (1991) to decompose the observed Self-esteem X Condition interaction into the simple effects of self-esteem in each experimental condition. As expected, the association between self-esteem and connection motivation was more strongly positive in the exercise condition, $\beta = .38$, 95% confidence interval of the unstandardized coefficient (CI) [0.08, 0.36], $t(113) = 3.14$, $p = .002$, compared to the no-exercise condition, $\beta = -.11$, 95% CI [-0.22, 0.09], $t(113) = -0.81$, $p = .421$. Next, we followed the same recommended procedures to explore the simple effects of condition for participants relatively low and relatively high in self-esteem (operationalized as one standard deviation below and above the mean, respectively). Results revealed that exercise did not have an appreciable effect on LSEs' connection motivation, $\beta = -.20$, 95% CI [-0.69, 0.10], $t(113) = -1.49$, $p = .140$, but caused HSEs to express stronger connection motivation, $\beta = .31$, 95% CI [0.09, 0.85], $t(113) = 2.43$, $p = .017$. We will return to these exploratory results after we report the results of Study 2, but taken together, these results are consistent with our proposal that arousal strengthens participants' signature social motivation during relationship initiation.

Table 1

Results of Hierarchical Regression Predicting Connection Motivation in Experiment 1

Predictor	Connection Motivation ($M = 3.02$, $SD = 0.76$)						
	β	b	95% CI	t	p	ΔR^2	f^2
Step 1 (df = 114)						.03	.03
Self-Esteem	0.16	0.09	[-0.01, 0.20]	1.72	.088		
Condition	0.07	0.10	[-0.18, 0.38]	0.70	.484		
Step 2 (df = 113)						.06	.07
Self-Esteem X							
Condition	0.36	0.29	[0.08, 0.49]	2.72	.008		

Figure 1

Participants' Connection Motivation as a Function of Self-Esteem and Arousal Condition in

Experiment 1

Note. Results are graphed for individuals scoring one standard deviation below (i.e., LSEs) and

above (i.e., HSEs) the study mean on self-esteem. Error bars represent standard errors.

Experiment 2

People commonly experience heightened arousal when they contemplate and engage in goal pursuit, which is thought to help prepare them for action (e.g., Fowles, 1988). In socially risky situations, where goal pursuit is meaningful and the outcome ambiguous, HSEs and LSEs are thought to experience different forms of arousal that reflect and reinforce their differing signature social motivations (Seery, 2011). For HSEs, arousal during interpersonal goal pursuit is characteristic of a challenge response aimed at marshalling energy to overcome barriers to goal pursuit, whereas for LSEs, arousal during interpersonal goal pursuit is characteristic of a threat response aimed at marshalling energy to protect the self from anticipated failure. Given that arousal engenders challenge attributions for HSEs whereas arousal engenders threat attributions for LSEs, changing people's attributions for their emotional arousal as they contemplate pursuing a social goal may also influence self-esteem differences in connection motivation during relationship initiation. We test this possibility in the current experiment.

Prior research reveals that if arousal is not attributed to a particular goal-relevant object (or person), and is attributed to another source instead, then such *misattribution of arousal* can eliminate the effect of arousal on behavior (e.g., Savitsky et al., 1998). Thus, we predict that although HSEs will be more interested in joining a new social group than LSEs in a control condition in which no attribution information is provided for their anticipatory emotional arousal, when they are led to misattribute their naturally-occurring arousal to a "noise" in the environment, this signature self-esteem effect will be minimized or eliminated all-together. Put another way, we anticipate that the positive association between self-esteem and connection motivation will be greater in the no-attribution condition than in the attribution condition (H2). As in Experiment 1, we also explore whether the predicted condition difference is driven by

increases in LSEs' connection motivation, decreases in HSEs' connection motivation, or changes among both groups.

Our hypothesis relies on the assumption that participants will experience anticipatory emotional arousal as they contemplate joining the new social group, which we can then lead them to attribute to a non-social source in the experimental condition. Prior research using a similar group-joining paradigm observed self-esteem differences in anticipatory social anxiety (i.e., emotional arousal) and resulting connection motivation (Anthony, Holmes, & Wood, 2007; Anthony, Wood, & Holmes, 2007). This result makes us feel optimistic that this group-joining paradigm is sufficiently risky to provoke signature self-esteem differences in emotional arousal and social motivation. But we wanted to hedge our bets. Therefore, we also include an orthogonal manipulation of social risk in this experiment to potentially heighten emotional arousal, and thus potentially allow the attribution manipulation to have a greater, and more detectable, effect. We adapted our social threat manipulation from Murray and colleagues (2008), which was designed to make salient the fact that social relationships are risky. The researchers observed that writing about a time that a significant other "let you down" heightened feelings of hurt, rejection, and disappointment compared to a control condition. Using the language of Schacter and Singer's (1962) two-factor model of emotion, this result means that the threat manipulation increased arousal, which the participants labeled as hurt, rejection, and disappointment. Thus, we use the same manipulation to heighten threat and emotional arousal in the current experiment. We anticipate that the predicted interaction between self-esteem and attribution condition (i.e., H2) will be stronger in the threat condition than in the no-threat condition (H2a).

Method

  Additional measures, methodological details (e.g., scripts), and analysis code are posted

in the OSM. As with Experiment 1, we did not obtain consent from participants to share their

data with other researchers, nor was the research pre-registered. This research received approval

from the Human Research Ethics Office at the University of Victoria (approval number: 16-121).

Participants

  Within the two weeks that we allotted to collect data at our campus student center (i.e.,

the *University Center*), we were able to recruit 439 participants. Data for 18 participants were

excluded because they did not believe the attribution manipulation. Data for another 15

participants in the threat condition were excluded because they did not follow the risk-priming

writing prompt. Data for five additional participants were excluded due to computer malfunction

or because the experimenter forgot to communicate the attribution information. This yielded a

final sample of 401 (M_{age} = 22.89 years, SD_{age} = 6.44 years; 220 women, 177 men, 4 did not

report; 13 Aboriginal/First Nations, 6 African-Canadian/Black, 67 Asian, 13 East Indian, 9

Hispanic, 310 White, 6 mixed race/ethnicity, 18 identified as ethnicities that were not listed).

Participants received a chocolate bar or pack of gum in appreciation for their time.

  Sensitivity analyses using G*Power (Faul et al., 2017) indicated that with this sample

size, 80% power, and α = .05, we could detect a population f^2 of .02 for the critical Self-Esteem

X Attribution condition interaction.

Procedure

  In a common area of the University Center, the experimenter invited potential

participants to complete a five-minute survey about "General Behaviors." The experimenter

informed participants there was electrical work being performed in the University Center that

produced a subtle sound (adapted from Savitsky et al., 1998). Participants in the *attribution condition* were also told: "These sounds have been found to cause individuals' heart rates to increase. People exposed to this subtle noise report feeling somewhat anxious or nervous." Participants in the *no-attribution condition* were told: "These sounds have been found to have no effect on people." Participants in both conditions were also told to ignore the noise if they noticed it.

To eliminate the possibility that participants would overhear the message for their non-assigned condition, all participants on a given day were assigned to a single attribution condition, and days were randomly assigned to condition. Fortuitously, there was construction taking place in the University Center during data collection, which supported our story.

After the attribution manipulation, participants completed a brief survey that assessed demographics (e.g., age, gender, ethnicity), self-esteem, and filler measures. Then, participants completed a writing task to manipulate the salience of social risk (Murray et al., 2008). Participants who were randomly assigned to the *no-threat condition* wrote about how they travel to campus, whereas participants in the *threat condition* wrote about a time when they were let down by someone close to them. Then participants read that our research lab was going to form and lead a focus group for research purposes "that involves meeting new people and interacting socially," and indicated their willingness to join the social group. Finally, participants were debriefed concerning the true purposes of the study.

Measures

Self-Esteem. Participants used a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*) to indicate their agreement with the statement "I have high self-esteem" (Robins et al., 2001).

Connection Motivation. Participants used a 9-point scale (1 = *very unlikely*, 9 = *very likely*) to indicate their agreement with two items tapping their willingness to join the social group: "How much would you like to participate in this focus group?" "How willing are you to attend sessions held late in the evenings, and on Saturday and Sunday mornings at 8am?" These items have been used in prior research to assess connection motivation during relationship initiation and have been found to reliably detect self-esteem differences in signature social motivation (Anthony, Holmes, & Wood, 2007; Anthony, Wood, & Holmes, 2007). Items were aggregated to form a reliable measure of *connection motivation,* (α = .75; *M* = 3.33, *SD* = 2.04).

Results and Discussion

Preliminary analyses indicated that none of the results we report below are moderated by participants' gender or race/ethnicity.
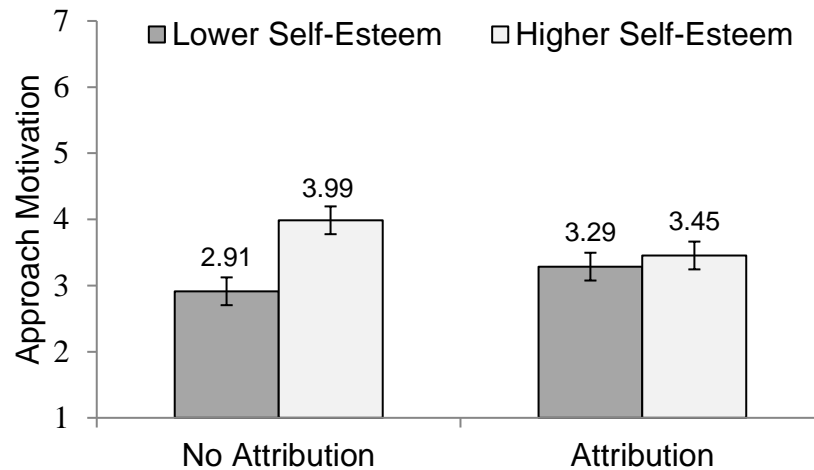
Recall that we predicted that the positive association between self-esteem and connection motivation would be greater in the no-attribution condition than in the attribution condition (H2), and that this interaction would be stronger in the threat prime condition than the no-threat condition (H2a). These two predictions would be evident by a two-way interaction between self-esteem and attribution condition and a three-way interaction between self-esteem, attribution condition, and threat condition, respectively. To test these hypotheses we first regressed participants' connection motivation onto: Step 1) mean-centered self-esteem (*M* = 4.78, *SD* = 1.56), dummy-coded attribution condition (0 = no attribution, 1 = attribution), dummy-coded threat condition (0 = no threat, 1 = threat); Step 2) the two-way interactions between variables; and Step 3) the three-way interaction among variables (see Table 2).

Once again we followed Aiken and West's (1991) recommendations for interpreting the results of this complex hierarchical linear regression, and for decomposing any interactions that

emerged. The three-way interaction entered in Step 3 of the analysis was not significant, which means that H2a was not supported and the threat manipulation did not moderate any of the two-way interactions that emerged in Step 2 of the analysis. Therefore, we proceeded to interpret the two-way interactions from Step 2 of the regression. This level of analysis revealed the predicted two-way interaction between self-esteem and attribution condition (see Figure 1). As predicted in H2, in the no attribution condition HSEs were more interested in meeting new people and socializing than LSEs, $\beta = .26$, 95% CI [0.11, 0.58], $t(391) = 2.92$, $p = .004$, but this signature self-esteem difference in connection motivation was eliminated when participants were given an alternative attribution for their arousal, $\beta = .04$, 95% CI [-0.16, 0.27], $t(391) = 0.48$, $p = .629$. We also explored whether this effect was driven by increases in connection motivation for LSEs, by decreases in connection motivation for HSEs, or whether both groups were responsive to the attribution manipulation. Compared to the no attribution condition, the attribution manipulation did not have a statistically significant effect on LSEs', $\beta = .09$, 95% CI [-0.33, 1.08], $t(391) = 1.05$, $p = .293$, or HSEs' connection motivation, $\beta = -.11$, 95% CI [-1.02, 0.14], $t(391) = -1.48$, $p = .139$. We will return to these exploratory results shortly and consider them in light of the results for Experiment 1.

Table 2

Results of Hierarchical Regression Predicting Connection Motivation in Experiment 2

Predictor	β	b	95% CI	t	p	ΔR^2	f^2
			Connection Motivation ($M = 3.33$, $SD = 2.04$)				
Step 1 (*df* = 394)						.00	.00
Self-Esteem	0.03	0.04	[-0.09, 0.17]	0.58	.563		
Attribution Condition	0.02	0.07	[-0.34, 0.47]	0.31	.754		
Threat Condition	-0.04	-0.16	[-0.56, 0.25]	-0.75	.453		
Step 2 (*df* = 391)						.03	.03
Self-Esteem X Attribution Condition	-0.16	-0.29	[-0.55, -0.03]	-2.21	.027		
Self-Esteem X Threat Condition	-0.17	-0.31	[-0.57, -0.05]	-2.35	.019		
Threat Condition X Attribution Condition	0.05	0.22	[-0.59, 1.03]	0.53	.597		
Step 3 (*df* = 390)						.00	.00
Self-Esteem X Threat Condition X Attribution Condition	0.04	0.12	[-0.40, 0.64]	0.45	.657		

Figure 2

Participants' Connection Motivation as a Function of Self-Esteem and Arousal Attribution

Condition in Experiment 2

Note. Results are graphed for individuals scoring one standard deviation below (i.e., lower self-esteem) and above (i.e., higher self-esteem) the study mean on self-esteem. Error bars represent standard errors.

An independent and unpredicted interaction between self-esteem and threat condition also emerged (see Table 2). Threat had no effect on LSEs' connection motivation, $\beta = .04$, 95% CI [-0.55, 0.90], $t(391) = 0.48$, $p = .634$, whereas threat decreased HSEs' connection motivation, $\beta = -.20$, 95% CI [-1.50, -0.10], $t(391) = -2.25$, $p = .025$. This interaction was unpredicted and it is the opposite of what previous research observed using this same manipulation in the context of a romantic relationship, whereby threat caused HSEs to express greater interest in pursuing risky avenues for increasing interdependence with their current romantic partner (Study 2, Murray et

al., 2008). However, there are some important differences between the current research and Murray and colleagues' research. We assessed participants' post-threat desire to join a new social group whereas Murray and colleagues assessed participants' post-threat desire to take risks to increase interdependence with their current romantic partner, and there are important differences in the threat-profiles of ongoing relationships versus new relationships that have implications for risk-regulation processes (for a discussion see Stinson, Cameron, & Robinson, 2015). For example, we may have observed a post-threat decrease in HSEs' willingness to join a new social group because they were psychologically focused on repairing the existing relationship that was threatened by our experimental prime (see Richman & Leary, 2009, for a discussion of motivational responses to threat). Future research could explore this possibility.

However, for our present purposes, it is sufficient to emphasize that the predicted self-esteem by attribution interaction that we described previously was statistically independent from this unexpected self-esteem by threat interaction. Moreover, the predicted self-esteem by attribution interaction still emerged in the no-threat condition, $\beta = -.20$, 95% CI [-0.71, 0.01], $t(196) = -1.91$, $p = .057$ (though halving the sample did reduce the observed p-value), as did the predicted pattern of simple effects: self-esteem predicted interpersonal attraction in the no attribution condition, $\beta = .29$, 95% CI [0.11, 0.65], $t(196) = 2.74$, $p = .007$, but not in the attribution condition, $\beta = .02$, 95% CI [-0.21, 0.27], $t(196) = 0.23$, $p = .821$. Thus, we believe that the observed effect of arousal attribution on signature social motivation is credible.

Mini-Meta-Analysis Across Experiments

One limitation of our research is that the exploratory simple-effects analyses examining condition effects for LSEs and HSEs in each experiment did not provide definitive results, as most of the p-values did not reach the traditional bar for statistical significance. However, non-

significant effects are common and expected in multi-study papers (Lakens & Etz, 2017).

Therefore, to obtain a more precise estimate of the effect of arousal on connection motivation as

a function of self-esteem, we followed current recommendations concerning best practices in

social psychological and personality science and conducted a mini meta-analysis of the results

for our two experiments (see Goh et al., 2016).

This mini meta-analysis was possible because each of our experiments included one

condition in which arousal or its influence was *weaker*, either because arousal was low (No-

Exercise Condition in Experiment 1) or because it was misattributed to the environment

(Attribution Condition in Experiment 2), and one condition in which arousal or its influence was

stronger, either because arousal was high (Exercise condition in Study 1) or because it was freely

attributed to the social context (No-Attribution Condition in Study 2). Thus, by reverse-coding

the condition effects for Experiment 2 so that the direction of the simple effects were the same in

both experiments, we were able to meta-analyze our results across studies to obtain an unbiased

estimate of the observed effects.

We followed Goh and colleagues' (2016) procedures for conducting a mini-meta-analysis

with fully random effects. Stouffer's Z-tests revealed that across experiments, stronger (vs

weaker) arousal decreased LSEs' connection motivation, $z = 1.79$, $p = .037$, $d = -.23$, but

increased HSEs' connection motivation, $z = 2.73$, $p = .003$, $d = .36$. The absolute magnitude of

these effects was similar, $Zdiff = 0.94$, $p = .174$. These are considered small to medium-sized

effects, respectively, which are typical in the social sciences (Rosenthal & Rosnow, 2008). Even

small effects can have meaningful theoretical and practical implications (Meyer et al., 2001),

which we will discuss shortly.

We used the same procedures to meta-analyze the self-esteem effects when arousal was stronger and weaker to get an unbiased estimate of those effects sizes as well. When arousal was weaker, self-esteem was unrelated to connection motivation, $z = 0.91$, $p = .181$, $d = -.05$, but when arousal was stronger, the association between self-esteem and connection motivation was large and positive, $z = 4.22$, $p < .001$, $d = .53$.

General Discussion

We sought to unpack the complex interactions between social risk, self-esteem, arousal, and connection motivation that characterize initiation dilemmas. Consistent with classic theories of arousal and attraction, and consistent with H1, the results of Experiment 1 demonstrated that arousal strengthened self-esteem differences in signature social motivation. Moreover, and once again consistent with prior research and H2, the results of our second experiment demonstrated that misattributing emotional arousal to the environment, rather than the social context, eliminated self-esteem differences in signature social motivation. The results of our mini meta-analysis also affirmed that both LSEs and HSEs were responsive to arousal: Stronger (vs weaker) arousal decreased LSEs' connection motivation, but increased HSEs' connection motivation.

The present research expands and adds nuance to current models concerning the social-regulatory function of self-esteem, including sociometer theory (Leary & Baumeister, 2000; Stinson, Cameron, & Huang, 2015) and risk-regulation theory (Murray et al., 2008). For example, prior research in these areas demonstrates that LSEs' and HSEs' signature responses to social risk are connected to more global motivational states (Cavallo et al., 2009). Thus, the threat of rejection by their romantic partner not only prompts LSEs to cautiously distance from their partner, but it also prompts them to make more cautious decisions about risky recreational activities like bungee jumping or white water rafting. Conversely, the same interpersonal threat

not only prompts HSEs to reactively seek closeness with their partner, but it also causes them to make more risky gambling decisions. Our results build on this and other research suggesting that social-regulatory systems are entwined with more primal, generalized regulatory systems (e.g., MacDonald & Leary, 2005; Seery, 2011), and re-affirms the central role played by self-esteem in regulating social behavior. Specifically, our results suggest that the self-esteem system may rely on the same neurobiological substrates that utilize arousal to regulate generalized appetitive and aversive motivation (e.g., Fowles, 1988; Gray, 1990). Moreover, our research demonstrates that an important aspect of the self can moderate the arousal-social motivation link, adding to the large body of literature explicating how, when, and why arousal regulates interpersonal attraction and connection motivation (e.g., Foster et al., 1998).

Our research also points to new lines of scientific inquiry. For example, it remains a bit of an open question as to whether signature social motivation is amenable to reflexive control. On the one hand, prior research suggests that risk-regulation is impulsive (e.g., Cavallo et al., 2012; Murray et al., 2008). Yet people do exhibit self-awareness concerning their use of defensive withdrawal and reactive connection behaviors. For example, people's self-reports concerning their withdrawal and connection behavior during relationship initiation correlate moderately with observer-reports of the same behaviors, and both self- and observer reports vary as a function of social risk (Stinson, Cameron, Hoplock, & Hole, 2015). In the current research, participants' cognitive misattribution of arousal also influenced their connection motivation, demonstrating that a more controlled level of processing (misattribution) can influence a more reflexive level of processing (reported connection motivation). Indeed, this principle undergirds clinical interventions like cognitive behavioral therapy.

These considerations have important implications for researchers who are interested in improving people's well-being. For example, it may be possible to develop simple, social-psychological interventions to decrease LSEs' reliance on social withdrawal as a means of regulating the anxiety (i.e., arousal that is labelled as 'anxiety') that is provoked by risky social situations. Our research suggests that re-framing people's attributions for their arousal may be one such intervention. However, one size will not fit all when it comes to social well-being interventions because, as our results illustrate, risk-relevant information often has opposite effects on LSEs' and HSEs' connection motivation (e.g., Stinson, Cameron, & Robinson, 2015). Thus, an intervention that guides people to attribute their risk-induced arousal to the environment, for example, might improve LSEs' connection motivation and thereby their social outcomes, but it might decrease HSEs' connection motivation and thereby undermine their social well-being.

This latter possibility hints at a potential mechanism to explain the "dark side" of higher self-esteem that has been observed in some research (e.g., Baumeister et al. 1996): HSEs may disengage from social situations that do not afford sufficient risk to trigger their reactive connection motivation, leading to poor social outcomes. Conversely, HSEs' reactive response to arousal may help to explain why they are more likely than their lower self-esteem counterparts to react to self-threats with anger (an approach-oriented emotion; Harmon-Jones, 2003), and zealous, anti-social defenses like aggression (MacGregor, 2006), particularly when their high self-esteem is unstable or narcissistic (e.g., Bushman et al., 2009). Indeed, although we have treated global self-esteem as a unidimensional construct, future research should seek to examine links between arousal and connection motivation for unstable versus stable or defensive versus genuine high self-esteem. We suspect that for people with unstable and/or defensive high self-

esteem, their responses to arousal during relationship initiation may look quite different from their stable and/or genuinely high self-esteem counterparts (for a discussion, see Kernis, 2003).

For researcher's seeking to improve LSEs' social outcomes, specifically, it is also important to understand that withdrawing from threatening social situations is a double-edged sword for LSEs. On the one side, it is an effective means for reducing anxiety and discomfort (Hayes et al., 2017). On the other side, social partners often mistake LSEs' withdrawal for social disinterest and mirror that disinterest back to LSEs (Cameron & Granger, 2019; Stinson et al., 2009). Thus, withdrawal may be psychologically palliative for LSEs, but it is socially harmful (at least in the short term), and this is one reason why researchers characterize LSEs' signature social motivation as *self-protective*: Withdrawal prioritizes personal psychological well-being (i.e., anxiety reduction) over other needs, like belonging. Yet even the personal benefits of defensive withdrawal may be short-lived. A relatively large body of literature reveals that inhibiting emotion and motivation can increase the risk of health problems in the long-term (e.g., Pennebaker, 1997; Polivy, 1998). So when the health risks of poor belongingness and chronic inhibition of impulsive desires are combined, LSEs' reliance on defensive withdrawal as a strategy for coping with social threats may explain why LSEs experience worse health outcomes than their higher self-esteem counterparts (e.g., Stinson & Fisher, 2020; Stinson et al., 2008). Thus, developing interventions to help LSEs regulate their anxious arousal in response to initiation dilemmas – and indeed, all manner of socially risky situations – without resorting to defensive withdrawal is a worthy goal for psychologists that we hope future researchers will continue to pursue.

Footnotes

[1] Two participants who identified as lesbians and six participants who did not report their sexual orientations were excluded from the sample. Note, however, that the results are the same if we include these participants' data in the analyses.

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