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**Why Change Now? Cognitive Reappraisal Moderates the Relation Between Anxiety and  
Resistance to Sunk Cost**

Jovian C. Lam & K. Lira Yoon

Corresponding Author:  
Jovian C. Lam  
jlam3@nd.edu  
University of Notre Dame  
390 Corbett Family Hall  
Notre Dame, IN 46556

Co-author:  
K. Lira Yoon  
lyoon@umbc.edu  
University of Maryland, Baltimore County  
Math/Psyc Building, 3rd Floor  
1000 Hilltop Circle  
Baltimore, MD 21250

### **Abstract**

To minimize distress associated with choices with uncertain consequences, individuals with high levels of anxiety may continue with familiar choices rather than seek out novel choices. As a result, they might be more vulnerable to sunk cost fallacy, the inability to ignore unrecoverable prior investments when making decisions about the future. Considering that cognitive reappraisal may mitigate the association between anxiety and poor decision making, the present study examined the relations between cognitive reappraisal, anxiety, and resistance to sunk cost. To this end, 108 undergraduates completed questionnaires assessing their tendency to engage in cognitive reappraisal, severity of anxiety, and resistance to sunk cost. Participants' tendency to engage in cognitive reappraisal moderated the relation between the severity of anxiety and resistance to sunk cost. However, in individuals who typically engaged in cognitive reappraisal, only lower levels of anxiety were associated with higher resistance to sunk cost. Individuals with high vs. low levels of anxiety might differ in how they reappraise negative situations, which can consequently affect resistance to sunk cost.

*Keywords:* anxiety; sunk cost; cognitive reappraisal; decision making; emotion regulation

### **Why Change Now? Cognitive Reappraisal Moderates the Relation Between Anxiety and Resistance to Sunk Cost**

Anxiety is linked to impaired decision making in general (e.g., Maner et al., 2007; Maner & Schmidt, 2006). Anxiety might be related specifically to lower resistance to sunk cost, which is the inability to ignore prior irreversible investments when making decisions about future events (e.g., Bruine de Bruin et al., 2007) due to several tendencies associated with anxiety. Specifically, the inability to endure the absence of sufficient information (i.e., intolerance of uncertainty; Dugas et al., 1998; Ladouceur et al., 1997), the tendency to avoid situations that are perceived to be threatening (i.e., risk aversion; Raghunathan & Pham, 1999), and the tendency to weigh potential losses more than potential gains (i.e. loss aversion; Charpentier et al., 2017) can lead to lower resistance to sunk cost. To minimize uncertainty and associated distress, individuals with high levels of anxiety often engage in maladaptive behaviors such as avoidance (e.g., Tanovic et al., 2018; Zinbarg et al., 1992). Behavioral avoidance in decision making manifests as an aversion to unfamiliar choices (i.e., risk aversion) to minimize perceived potential losses (i.e., loss aversion) (e.g., Luhmann et al., 2011). Consequently, their attempt to avoid unfamiliar choices could make anxious individuals more likely to repeat prior choices with which consequences are more familiar. Thus, we hypothesized that anxious individuals would exhibit lower resistance to sunk cost (i.e., stick with prior choices despite unfavorable outcomes).

Sunk cost fallacy refers to the propensity to continue on an investment due to the past unrecoverable time and resources spent on the investment (e.g., Bornstein & Chapman, 1995; Bruine de Bruin et al., 2007). Previous research suggests that adherence to the no-waste principle (Arkes & Blumer, 1985) is the key contributing factor to the sunk cost fallacy. That is, individuals who are vulnerable to sunk cost fallacy (i.e., lower resistance to sunk cost) continue

previous investments, because abandonment is perceived as wasteful. Effective decision makers are able to ignore unrecoverable past expenses when making decisions about current independent events, such that their decisions reflect only future possible outcomes (e.g., Bornstein & Chapman, 1995; Bruine de Bruin et al., 2007). In contrast, individuals with low resistance to sunk cost are more likely to repeat their previous efforts (i.e., continuing a prior investment even if it has proven to be undesirable).

Anxious individuals might be particularly vulnerable to sunk cost fallacy due to their risk aversion (e.g., Giorgetta et al., 2012; Maner & Schmidt, 2006), loss aversion (e.g., Charpentier et al., 2017), and intolerance of uncertainty (e.g., Tanovic et al., 2018). Anxious individuals may be more likely to perceive a novel choice as more threatening due to a lack of sufficient information. In turn, they may find novelty aversive and are less likely to pursue new choices to avoid distress elicited by uncertainty. Furthermore, individuals with anxiety are more reluctant to count their previous endeavors as losses (Molden & Hui, 2011). Their loss aversion, which might stem from their adherence to the no-waste principle, likely lead them to believe that the negative consequences of discontinuing previous investments (i.e., loss) would be greater than the potential gains from new choices. For example, anxious individuals might have difficulty quitting their jobs with which they are no longer satisfied due to their discomfort with the unfamiliarity associated with new jobs. They might still decide to stay in their current job even though they are aware that they are likely to be unhappy (i.e., continue with previous investments) rather than taking a chance with a new job. Therefore, sunk cost fallacy might be a manifestation of different types of avoidance in anxiety. That is, individuals with anxiety are likely to be biased to sunk cost fallacy to avoid negative affect resulting from abandoning their investments (e.g., Charpentier et al., 2017; Molden & Hui, 2011), distress associated with

uncertainty about new choices (e.g., Luhmann et al., 2011; Tanovic et al., 2018), and potential threats from taking a risk (e.g., Maner et al., 2007).

Notably, rumination, an emotion regulation strategy that emphasizes focusing on negative thoughts (e.g., Nolen-Hoeksema, 2000), might play an important role in the association between anxiety and vulnerability to sunk cost fallacy. Rumination involves perseverating (i.e., repeatedly thinking) over past symptoms of distress, and it maintains anxiety by undermining individuals' sense of control over their distress (e.g., Nolen-Hoeksema, 2000). Anxious individuals' tendencies to ruminate (e.g., Nolen-Hoeksema, 2000; Yook, Kim, Suh, & Lee, 2010) may make it more difficult to ignore their prior investments and effort (i.e., sunk cost). In fact, individuals who tend to ruminate exhibit difficulty with goal disengagement (van Randenborgh, Hüffmeier, LeMoult, & Joormann, 2010). On an anagram task that included unsolvable trials, participants who engaged in self-focused rumination perseverated on unsolvable trials, even after being told that skipping over difficult trials to solve easy trials first would maximize their scores (van Randenborgh et al., 2010). That is, although skipping difficult trials (i.e., goal disengagement) would be beneficial, individuals who ruminated exhibit difficulty disengaging from unattainable goals. In addition to intolerance of uncertainty and aversion to risks and losses, anxious individuals' tendency to ruminate might increase vulnerability to sunk cost fallacy.

Cognitive reappraisal, an emotion regulation strategy that emphasizes the reinterpretation of information (e.g., Ochsner & Gross, 2008), might have an opposite effect of rumination and counteract biases associated with anxiety (i.e., intolerance of uncertainty, risk/loss aversion) that could contribute to sunk cost fallacy. First, cognitive reappraisal might aid individuals in reinterpreting their previous failed investments (i.e., losses) by promoting the search for positive aspects in negative situations (e.g., learning valuable lessons from past failures). Indeed,

participants who were instructed to engage in cognitive reappraisal were less affected by framing effects when making decisions than participants who were instructed to suppress showing their emotions (Miu & Crişan, 2011). By effectively downregulating negative affect resulting from losses, cognitive reappraisal may aid in overcoming loss aversion (e.g., Sokol-Hessner et al., 2009). Consequently, individuals may be less vulnerable to sunk cost fallacy when engaging in cognitive reappraisal.

Engaging in cognitive reappraisal might also help anxious individuals re-interpret aversiveness associated with, and identify the potential benefits of, new and uncertain choices. Cognitive reappraisal is effective in lowering distress and anxiety (e.g., Gross & John, 2003; Hofmann et al., 2009), which may lead to less risk aversion when making decisions (e.g., Heilman et al., 2010; Lerner & Keltner, 2001). Similarly, cognitive reappraisal might aid in regulating distress elicited by unfamiliar, new choices.

### ***Present Study***

Sunk cost is especially relevant to individuals with anxiety, and resistance to sunk cost has direct real-world benefits (e.g., walking away from a long term yet abusive relationship or deciding when to terminate a continuation of a costly financial investment). Nevertheless, sunk cost has not received much attention. Thus, the present study examined the relation between the ability to resist sunk cost and the severity of anxiety, and whether this relation was moderated by individuals' tendency to engage in cognitive reappraisal. We assessed young adults' anxiety levels, propensity for cognitive reappraisal, and resistance to sunk cost. Given the association between anxiety and impaired decision making (e.g., Maner et al., 2007; Maner & Schmidt, 2006), we hypothesized that high levels of anxiety would be associated with less resistance to sunk cost, reflecting poor decision making. Drawing from Miu and Crisan (2011), we further

hypothesized that cognitive reappraisal would moderate the association between anxiety and resistance to sunk cost, such that the association between anxiety and difficulty resisting sunk cost would be stronger among individuals with a lower (vs. higher) tendency to engage in cognitive reappraisal. That is, anxious individuals who tended to engage in cognitive reappraisal would be better able to resist sunk cost than anxious individuals who tended not to engage in cognitive reappraisal.

## **Method**

### ***Participants***

No prior research examined whether cognitive reappraisal moderated the relation between anxiety and resistance to sunk cost. Thus, for power analysis with G\*Power, we used an effect size ( $f$ ) of 0.15 to indicate a small effect. With 95% power and an alpha level of .05, power analysis suggested a sample size of 107 participants; to account for potential missing data, 120 undergraduate students from a private Midwestern university in the United States were recruited for the study.

### ***Materials***

**Emotion Regulation Questionnaire (ERQ; Gross & John, 2003).** Participants completed the six-item Reappraisal subscale of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), which measures the habitual use of reappraisal. For example, individuals are instructed to rate how strongly they agree or disagree (1 = strongly disagree, 7 = strongly agree) with statements such as “When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm.” The ERQ has adequate internal consistency, with Cronbach’s  $\alpha$  ranging from .75 - .82 for the Reappraisal subscale in undergraduate samples (Gross & John, 2003). Cronbach’s  $\alpha$  in the current sample was .73 for the Reappraisal subscale.



**Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995).** To assess trait anxiety, participants completed the seven-item Anxiety subscale of the Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995), which measures trait anxiety by asking individuals to rate the frequency with which they experience (0 = never, 3 = almost always) physical arousal (e.g., “I experienced breathing difficulty.”) and fear (e.g., “I felt scared without any good reason.”). Reliability (Cronbach’s  $\alpha$ ) for the Anxiety subscale is high ( $\alpha = .87$ ; Antony & Bieling, 1998). In the current sample, Cronbach’s  $\alpha$  was .73 for the Anxiety subscale.

**Adult Decision Making Competency Index (ADMC; Bruine de Bruin et al., 2007).** Participants also completed the Resistance to Sunk Cost section of the performance-based Adult Decision Making Competency index (ADMC; Bruine de Bruin et al., 2007). The Resistance to Sunk Cost subtest contains 10 items that measure the ability to ignore prior failed investments using real-world scenarios. For example, participants were asked their likelihood to practice an expensive cello that they had bought but were no longer interested in playing or the likelihood of playing the guitar they were interested in but had been given for free, using a scale of 1 to 6 (1 = most likely to play the cello, 6 = most likely to play the guitar). In this particular example, choosing to play the guitar would indicate the ability to ignore prior financial investment on the cello (i.e., resistance to sunk cost). Reliability for the Resistance to Sunk Cost subtest is poor ( $\alpha = .54$ ), which the researchers attributed to participant fatigue given that the Sunk Cost subtest is the last subtest to be administered (Bruine de Bruin et al., 2007). In the current sample, reliability for the Sunk Cost subtest was acceptable (Cronbach’s  $\alpha = .75$ ).

### ***Procedure***

Undergraduate students taking psychology courses were recruited via SONA, an experiment sign-up system, for a study about decision making in exchange for course credit. Participants who signed up for the study were provided a link to an online survey site. After providing informed consent, they completed the measures. The procedure was approved by the local Institutional Review Board.

## **Results**

### ***Participant Characteristics***

Of the 120 participants, we excluded 12 participants: one participant who was under the age of 18 and 11 participants who did not respond to any of the relevant measures. Thus, the final sample included 108 young adults. In the final sample, there were four missing responses, which we replaced with zeros. The mean age of the participants was 19.18 ( $SD = 1.11$ ). The majority of the participants were female (65.74%) and Caucasian (63%).

Means and standard deviations of the study variables are presented in Table 1. Of note, the mean anxiety scores was 4.31 ( $SD = 6.72$ ), which is considered to be mild in the general population (Lovibond & Lovibond, 1995). Trait anxiety was not significantly correlated with cognitive reappraisal,  $r(106) = -.11, p = .27$ , and resistance to sunk cost  $r(106) = -.17, p = .08$ . However, cognitive reappraisal was significantly correlated with resistance to sunk cost,  $r(106) = .32, p < .001$ .

### ***Resistance to Sunk Cost***

A hierarchical regression analysis was conducted in RStudio Ver 1.1.456 with centered variables to test the hypothesis that cognitive reappraisal would moderate the association between the severity of anxiety and resistance to sunk cost. Cognitive reappraisal and anxiety scores were entered in Block 1, and the interaction between these two variables was entered in

Block 2.

Block 1 was significant,  $F(2,105) = 7.57$ ,  $R^2 = .13$ ,  $p < 0.01$ , 95% CI [3.92, 4.23]. The main effect of cognitive reappraisal was significant,  $\beta = 0.29$ ,  $t(105) = 3.45$ ,  $p < .01$ ,  $R^2 = .09$ , with higher cognitive reappraisal tendencies being associated with higher resistance to sunk cost. The main effect of anxiety was not significant,  $\beta = -0.02$ ,  $t(105) = -1.51$ ,  $p = .14$ ,  $R^2 = .02$ . Block 2 was also significant,  $F(3,104) = 6.72$ ,  $R^2 = .17$ ,  $p < .01$ , 95% CI [3.91, 4.21], and the addition of the interaction effect significantly improved the model,  $\beta = -0.03$ ,  $t(104) = -2.13$ ,  $p = .04$ ,  $\Delta F = 4.53$ ,  $\Delta R^2 = .04$ ,  $p = .04$ . The main effect of cognitive reappraisal continued to be significant,  $\beta = 0.26$ ,  $t(104) = 3.08$ ,  $p < .01$ ,  $R^2 = .08$ , but the main effect of anxiety was not significant,  $\beta = -0.02$ ,  $t(104) = -1.90$ ,  $p = .06$ ,  $R^2 = .03$ .

Follow-up simple slope analyses were conducted to probe the significant interaction. The association between the severity of anxiety and resistance to sunk cost was significant in individuals with high levels (i.e., +1 SD) of cognitive reappraisal,  $t = -2.61$ ,  $\beta = -0.05$ ,  $p = .01$ . Thus, lower levels of anxiety were associated with more resistance to sunk cost in individuals who tended to engage in cognitive reappraisal. In contrast, the association between the severity of anxiety and resistance to sunk cost was not significant in individuals with a lower tendency to reappraise (i.e., -1 SD),  $t = .14$ ,  $\beta = 0.001$ ,  $p = .89$  (see Figure 1)<sup>1</sup>.

### Discussion

The present study examined whether the association between resistance to sunk cost and the severity of anxiety was dependent on individuals' tendencies to engage in cognitive reappraisal. As hypothesized, cognitive reappraisal tendencies moderated the relation between the severity of anxiety and resistance to sunk cost. Among individuals with a higher tendency to

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<sup>1</sup> We repeated the analysis while excluding four outliers (i.e., two low reappraisal scores and two low resistance to sunk cost scores) identified by Tukey's method, which yielded the same results.

engage in cognitive reappraisal, higher levels of anxiety were associated with lower resistance to sunk cost. The nature of this interaction contradicted our hypothesis that greater reappraisal tendencies would mitigate the relation between anxiety and resistance to sunk cost such that anxious individuals with a higher (vs. lower) tendency to engage in cognitive reappraisal would exhibit higher resistance to sunk cost). Instead, the negative association between the severity of anxiety and resistance to sunk cost was present only in individuals with a higher tendency to reappraise.

It is unclear why individuals with high levels of anxiety who tended to engage in reappraisal did not have higher resistance to sunk cost than their anxious counterparts who typically did not engage in reappraisal. However, the benefits of cognitive reappraisal may not be universal. For example, previous literature has suggested that reappraisal goals (e.g., increasing positive emotions, decreasing negative emotions) and tactics (i.e., how individuals are reappraising) matter (e.g., McRae et al., 2012). It is possible that reappraisal goals and/or tactics might differ between individuals with high versus low levels of anxiety. Perhaps anxious individuals who typically use reappraisal are more likely to reappraise to justify their unsuccessful decisions. That is, anxious individuals might be reappraising their prior failed investments (e.g., “If I try a little harder, it will work out.”), thereby making it difficult to resist sunk cost.

Additionally, anxious individuals who tend to reappraise might use reappraisal to identify the benefits of previous unsuccessful actions. Justifying past failed investments (i.e., the reappraisal of sunk cost) could make them less open to potentially beneficial, but uncertain, choices. Reappraising sunk cost might also reinforce loss aversion and consequently perpetuate avoidance and anxiety; reinterpreting past failed investments could increase the perceived value

of those investments. Thus, anxious individuals might perceive abandonment of those investments to be more wasteful and harder to ignore, thereby reinforcing their loss aversion. As a result, they are likely to persist in previous efforts, perpetuating their intolerance of uncertainty by avoiding novelty. In contrast, when individuals with low levels of anxiety reappraise, they might reappraise distress associated with uncertain, new options (e.g., “The new option might not be as risky as I first thought.”) or their perspective on previous losses (e.g., “Walking away now can actually prevent any further losses.”), leading them to resist sunk cost better. Future studies should examine different goals and tactics related to the reappraisal of sunk cost and their effects on decision making in anxiety.

Several limitations are worth mentioning. First, we relied exclusively on self-report measures. Future studies might benefit from employing other methods (e.g., behavioral measures, informant reports). Additionally, we only assessed individuals’ general tendency to engage in cognitive reappraisal. Future studies should consider manipulating state cognitive reappraisal at the moment of decision making to better understand the role of cognitive reappraisal in resistance to sunk cost more fully. Similarly, future studies should examine resistance to sunk cost through a validated behavioral task and consider other relevant covariates (e.g., individuals’ socioeconomic status). Lastly, the current results are based on an undergraduate population with a restricted range of trait anxiety. The current results, in particular the absence of the association between anxiety and resistance to sunk cost and the unexpected nature of the interaction between anxiety and reappraisal, might be due to the low levels of trait anxiety in this sample. Thus, it would be important for future studies to examine the relations in a clinical sample.

Notwithstanding these limitations, we found that cognitive reappraisal tendencies moderate the relation between the severity of anxiety and the resistance to sunk cost. Interestingly, the association between anxiety and resistance to sunk cost was significant only among individuals who tended to engage in cognitive reappraisal, suggesting that individuals with high levels of anxiety did not benefit from their tendency to engage in cognitive reappraisal. Future studies should replicate and expand on these findings to fully understand the role of cognitive reappraisal in anxious individuals' ability to resist sunk cost.

Compliance with Ethical Standards:

Conflict of Interest: All authors declare no conflict of interest.

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Research involving Human Participants: This article does not contain any studies with animals performed by any of the authors. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institution

Informed consent: Informed consent was obtained from all individual participants included in the study.

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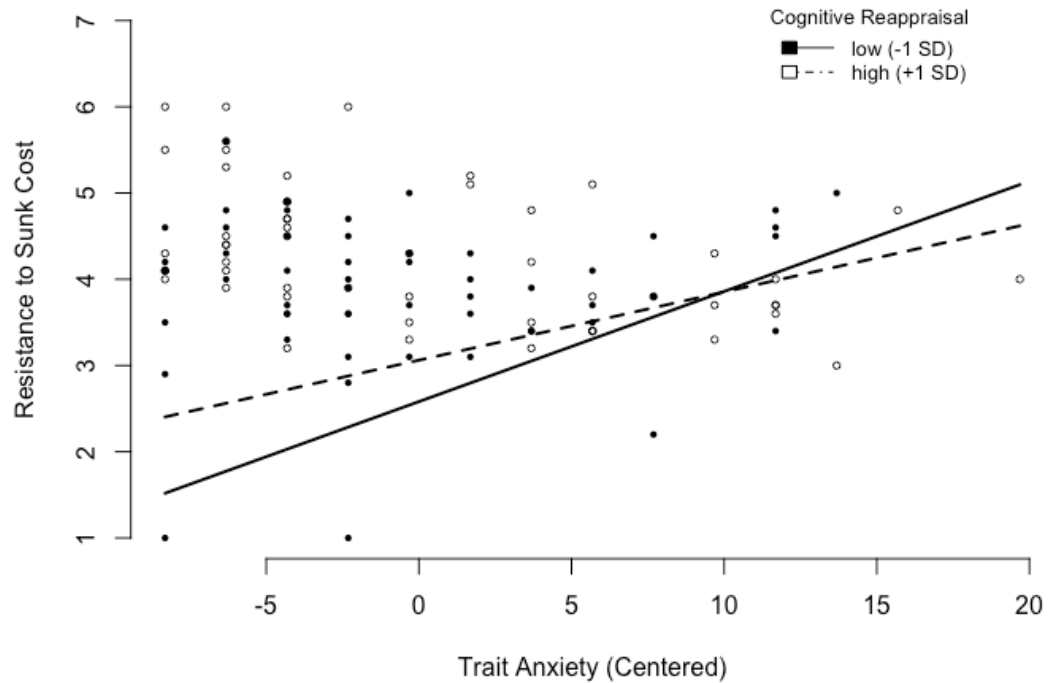
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**Table 1***Descriptive Statistics of Trait Anxiety, Cognitive Reappraisal, and Sunk Cost*

	Mean	SD	Range
Trait Anxiety	8.31	6.72	0 - 28
Cognitive Reappraisal	4.81	0.93	1- 6.67
Resistance to Sunk Cost	4.07	0.88	1 - 6

**Figure 1**

*Relation Between Trait Anxiety and Resistance to Sunk Cost as a Function of Cognitive Reappraisal*



*Note.* In individuals with higher levels of cognitive reappraisal (at 1 SD above the mean; the dotted line), higher levels of trait anxiety were associated with lower resistance to sunk cost. In individuals with low levels of cognitive reappraisal (at 1 SD below the mean; the solid line), trait anxiety levels were not associated with resistance to sunk cost.