Reactive Risk-taking: Anxiety Regulation via Approach Motivation Increases Risk-taking Behavior

by

Joshua Leota

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Science

Department of Psychology

University of Alberta

Abstract

Experimental research and real-world events demonstrate a puzzling phenomenon—anxiety, which primarily inspires caution, sometimes increases risk-taking. The goal of the present research was to test whether this phenomenon is due to the regulation of anxiety via reactive approach motivation (RAM), which may bias people towards rewards and mute sensitivity to negative outcomes. In Study 1 ($N = 231$), an academic anxiety threat caused increased risk-taking on the Behavioral Analogue Risk Task (BART) among trait approach-motivated participants. In Study 2 ($N = 230$), experimentally manipulated approach motivation caused increased risk-taking on the BART among trait approach-motivated participants. These results support a RAM interpretation of what I call *reactive risk-taking*. Approach-motivated individuals may regulate the aversive feeling associated with anxiety by becoming more approach motivated and therefore less sensitive to negative outcomes, resulting in a propensity for risk-taking behavior. Lastly, I discuss theoretical and practical implications of this research and potential directions for future studies.

Preface

This thesis is an original work by Joshua Leota. The research projects, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, "Personality and Social Cognition of Impulsive Behaviours", Protocol 00079790, 21/09/2018.

Acknowledgments

First, I would like to thank my advisor Kyle Nash for his guidance, composure, and enthusiasm for interesting ideas. Second, I would like to thank my committee members: Jeff Schimel for his creative and thoughtful insights, David Rast III for his statistical expertise, and Joe Hayes for the many inspiring conversations. I would also like to acknowledge The Alberta Gambling Research Institute for supporting this work. Lastly, and most importantly, I would like to thank Tess for her love and support despite the cold and dark Canadian winters.

Table of Contents

List of Figures

In a February 2009 Wall Street Journal article, financial columnist Jason Zweig reported that some investors were behaving surprisingly reckless during the fastest declining market in recent times (Zweig, 2009). The 2007-08 subprime mortgage crisis sparked a financial catastrophe that decimated the price of stocks and spread angst and uncertainty throughout the market. Despite the ominous market conditions, exuberant investors began to throw caution to the wind, transferring their money from safer, balanced funds to far riskier ones. Zweig (2009) described this perplexing behavior as the financial equivalent of the “Hail Mary pass” in football – a last-ditch, low probability heave, typically made in desperation. Similar instances of this puzzling behavior have been observed in other contexts. For example, gambling increases during troubling economic times (Kumar, 2009), poker players become riskier after agitating losses (Smith et al., 2009), and soldiers display increased risk-taking propensity after returning from violent combat (Killgore et al., 2008). Exuberant risk-taking in the face of anxious and uncertain times is an important yet puzzling phenomenon that has received little empirical investigation. Why do anxious experiences that intuitively promote caution, sometimes inspire people to push forward more recklessly?

The present research aims to provide evidence that anxiety-related risky exuberance (termed *reactive risk-taking* hereafter) is the result of a basic motivational process: reactive approach motivation (RAM; McGregor et al., 2010a; see also Jonas et al., 2014). Although anxiety initially promotes caution and vigilance (Gray & McNaughton, 2000), past research has demonstrated that anxious experiences cause some people to become approach motivated in an attempt to alleviate the uncomfortable affective state (McGregor et al., 2010a; Nash et al., 2011). Although approach motivation may regulate anxiety, it may also make people less sensitive to negative outcomes (Nash et al., 2012) and/or more sensitive to positive outcomes (Carver &

White, 1994; Smillie & Jackson, 2005), and thus, ironically, more open to taking risks (Hirsh et al., 2012).

Anxiety and Reactive Approach Motivation (RAM)

Pharmacological, neuropsychological, and behavioral studies on humans and animals demonstrate a basic goal-regulation process initiated by experiences of anxiety (Gray & McNaughton, 2000). Anxiety is an uncomfortable affective state of heightened arousal and vigilance that arises from goal conflict. The septo-hippocampal system responds to motivational conflict and uncertainty with immediate behavioral inhibition of the conflicted goal, while at the same time negatively biasing all goals (Gray & McNaughton, 2000; McGregor et al., 2010a). This response, initiated by the behavioral inhibition system (BIS), redirects behavior from dangers that cause goal uncertainty towards alternative, more feasible goals. When an alternative goal is located, the existing anxieties will feel less irritating because they are muted by the pursuit of the new goal. This pursuit is governed by the behavioral approach/activation system (BAS; Gray & McNaughton, 2000; see also Fowles 1980). The BAS promotes a kind of tunnel-vision and directs behavior toward rewards and positive outcomes (Elliot, 2008). The BIS and the BAS are two opposing systems (Corr, 2008; see also Corr, 2002). The BIS promotes increased sensitivity to threats and negative outcomes, whereas the BAS and approach motivation are thought to mute this sensitivity in the service of focused goal pursuit (Corr, 2002; Harmon-Jones & Harmon-Jones, 2008). In support of this, approach emotions and approach-related patterns of brain activity are associated with reduced sensitivity to aversive stimuli (Jackson et al., 2003; Lang, 1995; Nash et al., 2012). This suggests some people may initiate reactive approach-motivated states to resolve BIS-inspired anxiety and goal conflict (Jonas et al., 2014). Importantly, a variety of anxious experiences have been shown to cause reactive approach motivation (RAM) on self-report, implicit, behavioral, affective, and electroencephalographic (EEG) measures (Cavallo et al., 2009; McGregor et al., 2007; McGregor et al., 2008; McGregor et al., 2009a; McGregor et al., 2009b; McGregor et al., 2010a; McGregor et al., 2010b; Nash et al., 2010; Nash et al., 2011).

Prior research reveals that individuals with approach-motivated personalities are particularly prone to RAM (McGregor et al., 2010a). For example, approach-motivation-related dispositions like promotion focus (Lockwood et al., 2002), BAS sensitivity (Carver & White, 1994), and action control (Kuhl, 1994) predict RAM responses to anxious uncertainty (McGregor et al., 2010b). Similarly, self-esteem, a trait correlated with approach motivation (McGregor et al., 2007) and characterized by a tendency toward approach-motivated goals (Baumeister et al., 1989; Heimpel et al., 2006; Leonardelli et al., 2007), predicts RAM-related brain activity (McGregor et al., 2009a) and RAM-related attitudes (McGregor et al., 2007) following anxious experiences.

In sum, although RAM can be an effective antidote to BIS-activation and anxiety, particularly among approach motivated people, it may also leave people insensitive to negative outcomes and less restrained than they normally would be. Critically, approach motivated reduced restraint may affect ensuing decisions and behaviors, particularly those related to risk.

Risk-taking Following Anxiety

At first, the claim that anxiety can lead to risk-taking may appear inconsistent with past research. For example, dispositional anxiety predicts heightened perceptions of negative outcomes (Lerner & Keltner, 2000), pessimistic risk appraisals (Maner & Schmidt, 2006), and increased bias toward risk-avoidant behavior (Maner & Gerend, 2007). However, instances of anxiety-inspired risk-taking does have empirical precedent. For example, a study that analyzed the popular game show, "Deal or No Deal" found that contestants who experienced unfavorable outcomes early on became riskier (Post et al., 2008) in an attempt to escape anxious unease (as cited in Kestenbaum, 2006). Professional traders who incur morning losses trade more aggressively in the afternoon (Coval & Shumway, 2005; Garvey et al., 2007). Similarly, poker players become riskier after large and frustrating losses, despite knowing that riskier strategies generally lead to less success (Smith et al., 2009). This phenomenon also emerges in society at large. For example, during times of economic uncertainty, lottery ticket sales increase (Kumar, 2009). Further, usage of slot machines in Christchurch bars increased by 19% following the devastating 2009 earthquake, despite the fact that a sizable proportion of the slot machines were destroyed (Community and Public Health, 2012).

Anxiety-inspired risk-taking is not just bound to financial decisions. For example, social anxiety predicts risk proneness in domains such as drug use, heavy drinking, and unsafe sexual activity (Kashdan et al., 2006). High levels of general anxiety also predict risky driving behaviour, crashes, and DUI episodes (Dula et al., 2010). Likewise, certain people become risky following a relationship threat due to a basic shift towards approach motivation (Cavallo et al., 2009). In sum, although anxious experiences initially inspire caution, these experiences may also precede bouts of *increased* risk-taking for some people. I propose that these people may be regulating anxiety by becoming approach-motivated, leading to an insensitivity to negative outcomes and increased proneness to risk.

RAM and Risk-taking

Risk-taking is characterized by a reduced sensitivity to negative outcomes. Risk-takers undervalue negative outcomes, overvalue rewards, appraise risk as lower, and anticipate lower levels of anxiety during risk (Kahneman & Tversky, 1979; Zuckerman & Kuhlman, 2000). Risk propensity is also negatively associated with a neural responsiveness to negative outcomes (Santesso & Segalowitz, 2009). Disrupting function in the right prefrontal cortex, a brain area associated with the BIS and sensitivity to negative outcomes (Coan & Allen, 2004; Shackman et al., 2009) causes increased risk-taking (Knoch et al., 2006). Further, there is a strong body of research indicating that approach motivation plays an integral role in risk-taking. For example, approach motivation and risk-taking share the same dispositions and emotions, such as dispositional BAS, impulsivity, sensation-seeking, anger, and positive affect (Kim & Lee, 2011; Lerner & Keltner, 2000; Loewenstein et al., 2001; O'Connor et al., 2009). Further, risk-taking implicates certain approach-motivated neurophysiological structures, systems, and processes, such as dopaminergic processes, testosterone, and reward-related brain areas (Corr, 2002; Mohr et al., 2010; Platt & Huettel, 2008). Lastly, approach-related patterns of brain activation predict risk-taking behavior (Gianotti et al., 2009). In summary, risk-taking involves approach motivation and a bias toward the magnitude of positive (over negative) outcomes. Accordingly, although anxiety initially promotes caution, some people may respond with palliative approach motivation, resulting in a propensity for reactive risk-taking behavior.

Overview of Studies

The present research examines why anxious experiences may sometimes precede bouts of risk-taking. I predicted that the aversive experience of anxiety would activate approach motivation processes which would subsequently bolster reactive risk-taking behavior. In contrast to previous studies that have examined how risk-taking behavior relates to *trait* anxiety (e.g., Gasper & Clore, 1998; Lerner & Keltner, 2000; Maner & Gerend, 2007), I tested the hypothesis that risk-taking behavior can arise from reactions to *state* anxiety (i.e., anxious experiences) because anxious states are regulated by RAM.

Given that trait approach motivation is associated with RAM (Jonas et al., 2014; McGregor et al., 2010b), and risk-taking (Kim & Lee, 2011; O'Connor et al., 2009), I expected individuals prone to approach-motivated behavior to engage in more reactive risk-taking. Here, I measured trait approach motivation using the BAS subscale of the widely used BISBAS scale (Carver & White, 1994). The BAS subscale is characterized by increased sensitivity to rewards, heightened drive for achievement, and fun-seeking (Carver & White, 1994; Gable & Harmon-Jones, 2008). I hypothesized that individuals high in *trait* approach motivation would be more likely to engage in RAM following an anxious experience and, consequently, more prone to reactive risk-taking behavior.

Figure 1 presents a model representation of the reactive risk-taking hypothesis and illustrates which part of the hypothesis each study tests. Study 1 tests whether an anxiety manipulation causes increased risk-taking behavior, particularly among trait approach-motivated participants. Study 2 tests whether approach motivation is the mechanism driving risk-taking among trait approach-motivated participants. All studies reported here received ethical approval

(Protocol 00079790) from the University of Alberta Research Ethics Board.

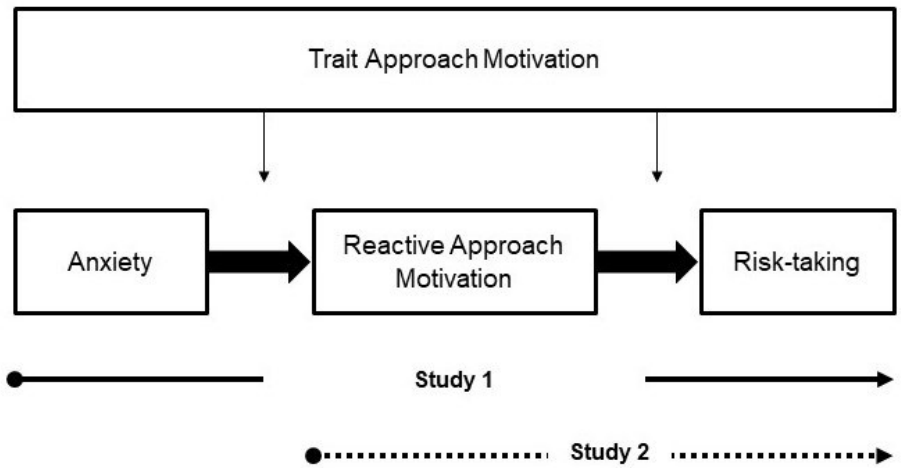

Figure 1. The proposed reactive risk-taking model for approach motivated individuals. The model posits that approach motivated individuals may regulate anxiety states with RAM, leaving them prone to risk-taking behavior. Note that Study 1 does not measure RAM as the psychological mechanism linking anxiety and risk-taking. Instead, I follow Spencer and colleagues (2005) who propose that, when the psychological mechanism is easy to manipulate, a series of experiments that demonstrate causality is superior to mediation. Thus, I experimentally manipulate approach motivation in Study 2 to provide evidence in support of the causal model.

Study 1: Achievement Anxiety Causes Risk-taking

In this study, I used an achievement anxiety manipulation which has reliably caused self-reported anxiety and RAM in past research (e.g., McGregor et al., 2008; 2009a; 2010b, Study 2; McGregor & Jordan, 2007; Nash et al., 2011, Study 1; adapted from McGregor et al., 2005, Study 1). I pre-registered the hypothesis that the anxiety manipulation would cause an overall increase in risk-taking behavior. Below, I report this finding as well as a *post hoc* exploratory analysis relating to the moderating role of trait approach motivation, which, in part, informed the rationale for Study 2.

Method

Open Science. The experimental design, a priori hypotheses, and confirmatory analysis plan were pre-registered at the Open Science Framework, and the pre-registration is available for download at: https://osf.io/9ezfp.

Participants and design. Assuming a small to medium effect size based on reports from related studies (e.g., McGregor et al., 2010a), I conducted an *a priori* power analysis using R (R Core Team, 2019) with $p = .05$, $\Delta R^2 = .035$, and power = .80 (Aberson, 2019). This analysis produced a recommended target sample of 222 participants. Thus, 253 undergraduate students from a Canadian University participated for class credit. Data from 235 participants (M_{age} = 19.15, SD_{age} = 2.12, 153 women, 82 men) were analyzed after excluding 14 participants for failing compliance criteria and four participants who were familiar with the experiment. The study used a between-subjects design with random assignment into two experimental conditions (anxiety vs. control). Trait approach motivation was included as a moderator variable and the anxiety (vs. control) manipulation as a between-subjects factor. Risk-taking, measured by adjusted average pumps on the Balloon Analogue Risk Task (BART), served as the dependent variable.

Procedure. Participants were welcomed and instructed to sit at an individual computer in a research lab. All responses were collected using Qualtrics and Inquisit software. After providing consent, participants completed a questionnaire that assessed demographic information, including age, gender, and ethnicity and a trait approach motivation measure within a short battery of personality questionnaires (all data available upon request).[1] Next, participants were randomly assigned to an achievement anxiety condition or a control condition. Following the manipulation, all participants competed the BART to assess risk-taking behavior before completing manipulation and compliance checks and a thorough debriefing.

Trait approach motivation. Carver and White (1994) developed a 13-item self-report BAS sensitivity instrument to measure trait approach motivation that has become widely accepted in the literature (Harmon-Jones et al., 2011). Participants rated the extent to which different statements generally apply to them. Sample items include "If I see a chance to get something I want, I move on it right away"; "When I see an opportunity for something I like, I get excited right away"; "I often act on the spur of the moment". Responses were recorded on a 5-point scale from *Strongly Disagree* (1) to *Strongly Agree* (5). The BAS subscale exhibits strong psychometric reliability (Cronbach's α = .76) and validity (Jorm et al., 1998).

Achievement anxiety (vs. control) manipulation. Participants were instructed to read a series of passages ostensibly from a popular psychology statistics textbook and told that we the researchers were interested in how understandable the passages were. In the achievement anxiety condition, participants were presented with passages taken from an advanced graduate statistics textbook, dense with intimidating formulae and symbols. Key phrases and symbols were removed to make these passages even more unintelligible. In the control condition, participants

[1] Each study contained a short battery of personality variables to a) bolster our cover story that all the materials in the study measure personality in different ways, and b) potentially conduct a meta-analysis in future research on dispositions that drive RAM. These dispositions included: self-esteem (Rosenberg, 1965), trait BIS and BAS (Carver & White, 1994), regulatory focus (2 scales; Higgins et al., 2001; Lockwood et al., 2002), uncertainty aversion (Greco & Roger, 2001), attachment style (Fraley et al., 2000), self-efficacy (Schwarzer & Jerusalem, 1995), rational-experiential thinking styles (Norris et al., 1998), and self-control (Tangney et al., 2004), the big five (Gosling et al., 2003), and aggression (Bryant & Smith, 2001). Not all measures were included in both studies.

were presented with more understandable passages about the benefits of statistics (see Appendix A and Appendix B for the achievement anxiety and control condition passages, respectively). Participants were then asked to report how well they understood each passage. This achievement anxiety manipulation (compared to the control) has produced self-reported anxiety and RAM in over 10 separate published studies (e.g., McGregor, et al., 2009; Nash et al., 2010).

Risk-taking dependent variable. Risk-taking behavior was measured using the Balloon Analogue Risk Task (BART; Lejuez et al., 2002). Participants were instructed to pump up virtual balloons on a computer screen by pressing the space bar. Each pump slightly inflates the balloon and earns the participant raffle entries towards a $100 cash prize. However, each pump brings the balloon closer to a randomly determined threshold where the balloon will explode, and the participant will lose all the raffle entries earned on that trial. Importantly, participants can "collect" at any point prior to the balloon exploding, and the raffle entries earned from that trial will be added to their total (e.g., collect after 25 pumps, 25 entries are added to the total). Each participant completed 30 trials (i.e., 30 different balloons). In sum, each pump increases the potential risk and reward. Therefore, the average number of pumps is an average measure of a participant's risk-taking behavior. The BART shows strong reliability and validity as a measure of behavioral risk-taking in numerous psychological and behavioral economic studies (Lejuez et al., 2002).

Manipulation check. Participants were asked to retrospectively rate how the statistics comprehension task made them feel the following adjectives: *Good, Happy, Smart, Successful, Likeable, Meaningful, Frustrated, Confused, Uncertain, Empty, Anxious, Insecure, Lonely, Ashamed, and Stupid* (McGregor et al., 2010a, Study 2). As a self-reported measure of anxiety, I created a Felt-anxiety-composite (Cronbach's α = .81) from all anxiety-related adjectives, including anxious, confused, uncertain, frustrated, and insecure.

Results

Manipulation check. Felt-anxiety composite scores were calculated and standardized (z-score). A one-way ANOVA demonstrated that participants in the achievement anxiety condition reported higher Felt-anxiety-composite scores (M = 0.38, SD = 1.03) than participants in the control condition (M = -0.38, SD = 0.81), F (1, 224) = 38.35, $p < .001$, $\eta^2_p = .15$. Thus, the achievement anxiety task caused greater self-reported anxiety in this sample, compared to the control task.

Main effect of achievement anxiety on risk-taking. I first examined assumptions and checked for outliers. No outliers were identified. The dependent measure, adjusted mean pumps on the BART, was computed by taking the mean of all non-exploded balloons and then standardized (z-score). As in past research, I used the adjusted mean (i.e., the mean number of pumps on collected balloons only)[2] instead of an absolute mean because the number of pumps was necessarily constrained on exploded balloons, which limits the between subjects variability (see Lejuez et al., 2002). Thus, the standardized adjusted mean pumps variable (i.e., risk-taking variable) was entered into a one-way ANOVA to test whether the achievement anxiety manipulation caused increased risk-taking. As predicted, those in the achievement anxiety condition demonstrated increased risk-taking (M = 0.15, SD = 1.01) compared to those in the control condition (M = -0.15, SD = 0.97), F (1, 233) = 5.54, $p < .05$, $\eta^2_p = .02$.

[22] The adjusted mean pumps were used as the dependent variable for Study 2 also.

Trait approach motivation moderation analysis. Participant's trait approach motivation scores were calculated and then mean-centered (Aiken & West, 1991). I conducted a hierarchical linear regression analysis to determine whether trait approach motivation moderated the effect of achievement anxiety on risk-taking. The regression model was significant at Step 1, $R^2 = .04$, $F(2, 232) = 4.77$, $p = .009$. Achievement anxiety, $B = 0.31$, $SE = .13$, $t(232) = 2.44$, $p = .016$, 95% CI = [0.06, 0.57], and trait approach motivation, $B = 0.29$, $SE = .15$, $t(232) = 1.98$, $p = .049$, 95% CI = [0.002, 0.58], were significant predictors of risk-taking. In support of my hypothesis, the addition of the achievement anxiety by trait approach motivation interaction term at Step 2 accounted for significant additional variance, $R^2 = .06$, $\Delta R^2 = .02$, $\Delta F(1, 231) = 5.75$, $p < .05$, $B = 0.70$, $SE = .29$, 95% CI = [0.12, 1.27].

A simple slopes analysis demonstrated that among participants high in trait approach motivation (+1 SD), achievement anxiety increased risk-taking behavior compared to the control condition, $B = 0.60$, $SE = .17$, $t(231) = 3.43$, $p < .001$, 95% CI = [0.25, 0.94]. Among participants low in trait approach motivation (-1 SD), achievement anxiety had no effect on risk-taking behaviour, $B = 0.0076$, $SE = .18$, $t(231) = 0.04$, $p = .97$, 95% CI = [-0.35, 0.36]. These results support the hypothesis that trait approach-motivated participants would be the most prone to risk-taking behavior following an anxious experience (Figure 1). I ran these same analyses with trait promotion focus (Lockwood et al., 2002) as an additional measure of trait approach motivation and the same significant pattern of results was found.

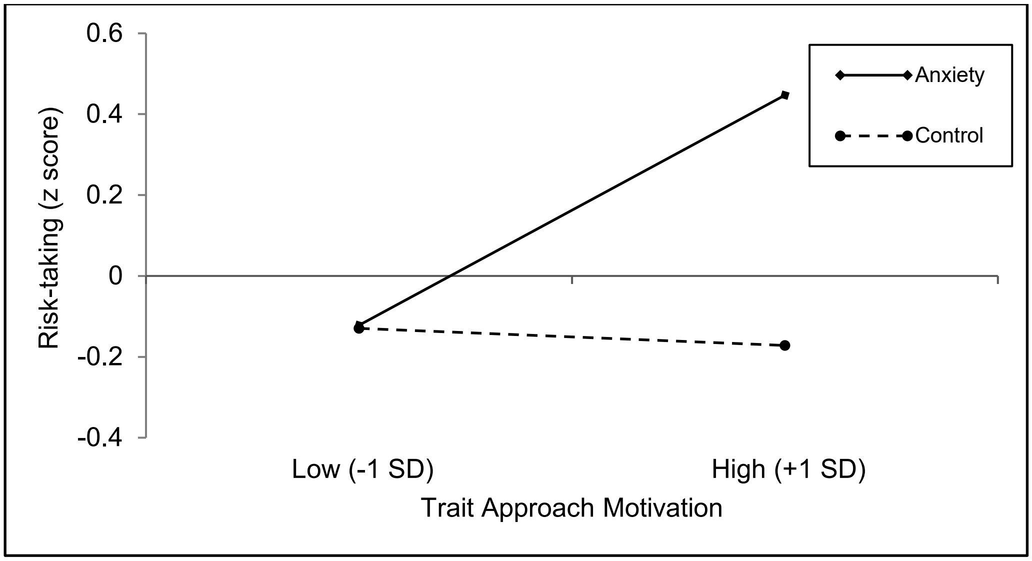

Figure 2. Study 1: Standardized mean adjusted pumps on the BART (i.e., risk-taking) as a function of trait approach motivation and condition (anxiety vs. control).

Study 2: Approach Motivation Causes Risk-taking

Study 1 demonstrates that state anxiety leads to increased risk-taking behavior, especially among trait approach-motivated participants. In Study 2, I experimentally manipulated approach motivation, the proposed psychological mechanism (Spencer et al., 2005) of the reactive risk-taking hypothesis, and assessed its effect on risk-taking. I pre-registered two hypotheses. First, I predicted that participants in the approach motivation condition would exhibit increased risk-taking behavior compared participants in the control condition. This prediction fits the reactive risk-taking model that positions approach motivation as the psychological mechanism driving anxiety-inspired risk-taking. However, prior research also shows that individual differences in trait motivation moderate people's sensitivity to motivational stimuli and primes (De Dreu et al., 2011; May et al., 2016). Specifically, motivational primes are most effective when they are congruent with the individual's motivational predisposition (Larsen & Ketelaar, 1989, 1991; Lockwood et al., 2002). Therefore, I pre-registered and tested a second hypothesis, namely that approach motivated participants specifically would show higher levels of risk-taking in the approach motivation condition compared to the control condition.

Method

Open Science. The experimental design, a priori hypotheses, and confirmatory analysis plan were pre-registered at the Open Science Framework, and is available for download at: https://osf.io/tcr56/.

Participants and design. Assuming a small to medium effect size based on reports from related studies (e.g., Schumann et al., 2014), I conducted an *a priori* power analysis using R (R Core Team, 2019) with $p = .05$, $\Delta R^2 = .038$, and power = .80 (Aberson, 2019). This analysis produced a recommended target sample of 214 participants. Thus, 250 undergraduate students from a Canadian University participated for class credit. Data from 225 participants (M_{age} = 18.71, SD_{age} = 1.65, 162 women, 62 men, 1 genderfluid) were analyzed after excluding 18 participants for failing compliance criteria, 10 participants who were familiar with the experiment, and three participants for technical issues. The study used a between-subjects design with random assignment into two experimental conditions (approach vs. control). Trait approach motivation was again included as a moderator variable and the approach (vs. control) manipulation as a between-subjects factor. Risk-taking, measured by adjusted average pumps on the BART, served as the dependent variable.

Procedure. Participants were welcomed and instructed to sit at an individual computer in a research lab. All responses were collected using Qualtrics. After providing consent, participants completed a questionnaire that assessed demographic information, including age, gender, ethnicity, and trait approach motivation. Next, participants were randomly assigned to an approach motivation condition or a control condition. Following the manipulation, all participants competed the BART to assess risk-taking behavior before completing manipulation and compliance checks and a thorough debriefing.

Approach motivation (vs. control) manipulation. Participants in the approach motivation condition were first instructed to imagine something that they desire so eagerly that they get excited when they even think about it. They were prompted that it might be something specific, like a relationship partner, career, 'A' grade, vacation etc., or it might be something more general that inspires and empowers them, such as acceptance, self-respect, freedom, kindness, social justice, and so on. Next, they were instructed to "describe what you powerfully desire, and how you feel when you imagine yourself approaching it" for five minutes. Participants in the control condition were asked to write for five minutes about any thoughts that come to mind as they let their mind wander. The approach motivation writing task has been widely used in past research to activate an approach-related orientation, termed promotion focus (e.g., Higgins, 1997, 1998; McGregor et al., 2010a). Importantly, dispositional and situational promotion focus predict sensitivity to approach-related emotional words, reward-maximizing behavioral strategies, more intense emotions during approach motivated goal pursuit, and approach-related patterns of brain activity (Amodio et al., 2004; Higgins, 1997, 1998; Leonardelli et al., 2007). Also, recall that high trait promotion focus participants responded to anxiety with increased risk-taking in Study 1. I hypothesized that this approach motivation task would cause increased risk-taking, particularly among trait approach-motivated participants.

Risk-taking dependent variable. Due to time restrictions, risk-taking behavior was measured using a brief version of the BART with a lower maximum pumps per balloon threshold (30) and 20 balloon trials instead of 30. Much like the standard BART, this brief BART exhibited high reliability (Cronbach's alpha = .92). The incentive structure was identical to Study 1, with pumps earning raffle entries towards a $100 cash prize.

Manipulation check. Like in Study 1, participants were asked to retrospectively rate how the approach motivation (or control) manipulation made them feel the following adjectives: *Good, Happy, Smart, Successful, Likeable, Meaningful, Frustrated, Confused, Uncertain, Empty, Anxious, Insecure, Lonely, Ashamed, and Stupid* (McGregor et al., 2010a, Study 2). Approach motivation is thought to mute BIS-related anxiety in service of goal pursuit and positive affect (Corr, 2002). Therefore, I expected participants in the approach motivation condition to report lower levels of anxiety compared to those in the control. The same Felt-anxiety-composite (Cronbach's α = .83) as Study 1 was created as a self-reported measure of anxiety from all anxiety-related adjectives (including anxious, confused, uncertain, frustrated, and insecure) to test this prediction.

Results

Manipulation check. Felt-anxiety composite scores were calculated and standardized (z-score). A one-way ANOVA revealed that participants in the approach motivation condition reported lower Felt-anxiety-composite scores (M = -0.40, SD = 0.95) than participants in the control condition (M = 0.44, SD = 0.86), F (1, 220) = 48.00, $p < .001$, $\eta^2_p = .18$. This result suggests that the approach motivation task muted self-reported anxiety in this sample, compared to the control task.

Main effect of approach motivation on risk-taking. I first examined assumptions and checked for outliers. No outliers were identified. The adjusted mean pumps variable was standardized (z-score) and entered into a one-way ANOVA to test whether the approach motivation prime caused increased risk-taking. Participants in the approach motivation condition did not demonstrate significantly different risk-taking behavior on the BART (*M* = 0.04, *SD* = 0.98) to those in the control condition (*M* = -0.04, *SD* = 1.02), *F* (1, 223) = 0.30, *p* = .59, η^2_p = .001. Thus, my first pre-registered hypothesis was not supported.

Trait approach motivation moderation analysis. Participant's trait approach motivation scores were calculated and then mean-centered (Aiken & West, 1991). I conducted a hierarchical linear regression analysis to determine whether trait approach motivation moderated the effect of the approach motivation prime on risk-taking. The regression model was not significant at Step 1, R^2 = .017, *F* (2, 222) = 1.89, *p* = .15. The approach motivation prime, *B* = 0.56, *SE* = .13, *t* (222) = 0.42, *p* = .67, 95% CI = [-0.21, 0.32], and trait approach motivation, *B* = 0.28, *SE* = .15, *t* (222) = 1.86, *p* = .06, 95% CI = [-0.02, 0.57], were not significant predictors of risk-taking (although the trait approach motivation term approached significance). In support of my hypothesis, the addition of the approach motivation prime by trait approach motivation interaction term at Step 2 accounted for significant additional variance, R^2 = .04, ΔR^2 = .03, ΔF (1, 221) = 6.34, *p* = .01, *B* = 0.75, *SE* = 0.30, 95% CI = [0.16, 1.33].

A simple slopes analysis demonstrated that among participants high in trait approach motivation (+1 SD), the approach motivation task increased risk-taking behavior compared to the control condition, *B* = 0.39, *SE* = 0.19, *t* (221) = 2.09, $p < .05$, 95% CI = [0.02, 0.76]. Among participants low in trait approach motivation (-1 SD), the approach motivation task had no effect on risk-taking behaviour, *B* = -0.27, *SE* = 0.19, *t* (231) = -1.46, *p* = .14, 95% CI = [-0.64, 0.09]. These results support the pre-registered hypothesis that trait approach-motivated participants would be the most prone to risk-taking behavior following an approach-motivated experience (Figure 3).

Figure 3. Study 2: Standardized mean adjusted pumps on the BART as a function of trait approach motivation and condition (approach vs. control).

Discussion

Past research has demonstrated that anxiety causes palliative RAM (McGregor et al., 2010a; Proulx et al., 2012), and that approach motivation heightens sensitivity to rewards (Boksem et al., 2008; Carver & White, 1994) and disrupts sensitivity to negative outcomes (Nash et al., 2012). The studies reported above demonstrate that both anxiety and approach motivation can promote risk-taking behavior. Specifically, in Study 1, achievement anxiety caused increased risk-taking behavior on the BART, especially among trait approach motivated participants. In Study 2, an approach motivation prime caused increased risk-taking behavior on the BART among trait approach motivated participants. RAM responses to anxiety thus appear to leave approach-motivated people prone to risk. These results help solve the puzzling phenomenon of why an anxious experience—that usually encourages people to halt and carefully survey their options—can sometimes evoke brash and reactive risk-taking.

Emotion and Motivation in Risk-Taking

The present findings add to the emerging literature that examines the interaction between emotion and risk-taking. Although traditional economic theories tend to suggest that decision-making is a controlled and dispassionate process, recent psychological and neuroscience research has demonstrated the integral role of human emotion in risky decisions and behavior (for a review, see Kusev et al., 2017). For example, Loewenstein and Lerner (2003) highlight the influence of *anticipatory* and *incidental* emotions on risk-taking. Anticipatory emotions arise from contemplating different choice outcomes and can uniquely guide decision-making. For example, an investor might experience immediate fear at the prospect of buying a high-risk stock. This fear might then discourage him from investing. Conversely, incidental emotions arise from factors unrelated to the decision, much like in the experimental paradigms reported in the present research, and can also uniquely affect decisions. For example, an investor's pre-existing good mood might cause him to feel overly optimistic about the future of the high-risk stock, and thus more likely to invest. Several studies show that the directional influence of anticipatory and incidental emotions adhere to a mood congruency effect—namely that positive emotions predict risk-seeking while negative emotions predict risk-aversion (Bower, 1991; DeSteno et al., 2000; Isen et al., 1978; Forgas, 1995; Johnson & Tversky, 1983). However, other research contradicts the mood congruency hypothesis. For example, the Mood Maintenance Theory (Isen & Patrick, 1983) posits that people in happy moods may be more reluctant to take risks in an effort to preserve their positive emotional state (Isen et al., 1988). Further, Lerner and Ketler (2000, 2001) demonstrated that two negative emotions, fear and anger, have divergent effects on risk-taking behavior. Induced fear was associated with risk-averse choices while induced anger predicted risk-seeking decisions. These findings suggest that it may not be the valence of the emotion that determines its specific impact on risk-taking, but perhaps some other aspect of the emotion. In fact, fear and anger do differ on a separate but important dimension—namely, their motivational underpinnings. Fear relates to an aversive or avoidance motivational system, whereas anger relates to an appetitive or approach motivational system (Carver & Harmon-Jones, 2009). This suggests that the findings reviewed above may not reflect a mood congruency effect per se, but rather a *motivational* congruency effect, such that approach-emotions predict risk-seeking and avoidance emotions predict risk-aversion.[3] In support of a motivational congruency effect on risk-taking, past research has demonstrated that other approach emotions, such as power, dominance, and excitement—predict risk-seeking decisions and behavior (Anderson & Galinsky, 2006; Demaree et al., 2009; Knutson & Greer, 2008). The present research also supports this view. Although anxiety is not an approach emotion, some people engage in approach motivation (i.e., RAM) to alleviate anxious unease (McGregor et al., 2010a; Nash et al., 2011). Consistent with this, an unpublished study from our lab found that an anxious experience caused increased approach emotions among approach-motivated participants. In sum, our findings support a motivational congruency effect of emotion on risk-taking. Future research could examine how the emotion relief—a positive but avoidance motivated emotion—affects risk-taking to further disentangle emotional valence from motivational direction.

Future research could also examine the interaction between emotion, motivation, and additional key components of decision-making related to risk, such as the current value state

[3] Indeed, there is much overlap between negative emotions and avoidance emotions (and positive emotions and approach emotions), which could explain why past theories have posited a mood congruency effect.

(e.g., whether one is in the domain of gains or losses; Zou et al., 2020). For example, people perceive losses as more painful than equivalent gains are pleasant (see prospect theory; Kahneman & Tversky, 1979). Thus, people on average are more willing to take risks to avoid losses than they are to accumulate gains. Importantly, Zou and colleagues (2020) propose a three-factor motivational model of risk-preference that describes how key individual differences in motivational goal pursuit modulate risk-taking in domains of gains and losses. For example, in the domain of losses, prevention-focused individuals (i.e., those who are motivated to avoid losses; Zhang et al., 2014) prefer riskier options when they are the only way to eliminate loss, but prefer less risky options when they offer a more certain way to eliminate loss (Scholer et al., 2010). Conversely, in the domain of gains, promotion-focused individuals (i.e., those who are motivated to obtain gains; Higgins, 1997, 1998) prefer riskier options when their reference point is unchanged (stuck at the status quo), but prefer less risky options after experiencing a large gain (Zou et al., 2014). Future research could examine the impact of incidental emotions, such as anxiety, on risk-taking within domains of gains and losses. I would predict that anxiety-inspired RAM would cause different responses depending on motivational system (i.e., promotion vs. prevention) and current value state (i.e., domain of gains vs. losses). If RAM is characterized by focused goal pursuit and insensitivity to negative outcomes, then prevention-focused individuals may respond to anxiety by becoming even riskier when offered a way to eliminate loss, given that the preferable outcome would service their *non-loss* goals. Similarly, promotion-focused individuals may respond to anxiety with increased risk-taking within the domain of gains, given that the preferable outcome would service their *gain* goals. In fact, recall that in Study 1, promotion-focused individuals increased risk-taking on the BART (domain of gains) following an anxious experience. Future research could further examine how incidental anxiety, motivational systems, and different domains interact together to predict risk-taking behavior.

Implications for Defensive Behaviors and Cognitive Effects

The present findings could offer new insights into other types of defensive behaviors and cognitive effects. For example, reduced sensitivity to negative outcomes associated with RAM states may contribute to our understanding of certain hostile behaviors that have been observed to follow anxious experiences, including greed (Kasser & Sheldon, 2000), aggression (Jonas & Fritsche, 2013; McGregor et al., 1998), religious extremism (McGregor et al., 2010b), and ethnocentrism (Castano et al., 2002; for a review, see Jonas et al., 2014). During anxious and uncertain times, approach-motivated individuals may discount the costs associated with such behaviors, much like how reactive risk-takers may discount the downside of certain gambles. Hostile behaviors void of their negative outcomes can seem appealing. A failure to consider negative consequences could help explain why people are quick to defend the ingroup at the expense of others following anxious experiences (McGregor et al., 2008; McGregor et al., 2010b; McPherson & Joireman, 2009; Pyszczynski et al., 2006). Future research could investigate whether RAM-specific insensitivity to negative outcomes mediates these effects.

The present research has implications for certain “cold” cognitive effects traditionally assumed to be absent of emotional and motivational processes. For example, effects like the “house money effect”, “break-even effect”, “sunk cost effect”, “gambler’s fallacy”, and “hot hand effect” describe one’s willingness to accept gambles following prior gains, losses, or unusual sequences of events (Ayton & Fischer, 2004; Burns & Corpus, 2004; Thaler & Johnson, 1990; Tversky & Kahneman, 1971). Interpretations of these effects often implicate cold cognitive processes, asserting the importance of editing and reframing techniques, reference points, and heuristics (Kahneman et al., 1982; Tversky & Kahneman, 1979; Thaler, 1985). Yet, these phenomena rarely occur within contexts devoid of emotion. Decisions to cease or continue taking risks in the face of exciting wins or crushing losses are likely to depend, in part, on prior emotions, such as anxiety. Research on how emotion regulation processes such as RAM affect decision-making may contribute to our understanding of these, and other, putatively cold cognitive effects.

Limitations and Future Directions

The present research examines the seemingly ironic phenomenon of anxiety-inspired risky behavior. In doing so, I provide novel experimental evidence that this phenomenon is a result of palliative RAM. However, certain questions remain. First, it is unclear from the present research precisely how RAM leaves approach-motivated people prone to reactive risk-taking. Decisions involving risk involve a choice between prospects (Kahneman & Tversky, 1979). That is, contrasting the likelihoods of varying positive and negative outcomes. Thus, risk-taking can occur when either a.) positive outcomes are overvalued, b.) negative outcomes are undervalued, or c.) both a. and b. occur. There is substantial evidence that approach motivation heightens sensitivity to positive outcomes and motivationally salient stimuli. For example, traits related to approach motivation are associated with positive reactions to expected rewards (Carver & White, 1994), sensitivity to potential gains (Smillie & Jackson, 2005), and reward-maximizing strategies (Higgins, 1997). There is also evidence that approach motivation decreases sensitivity to negative outcomes. The joint subsystem hypothesis (Corr, 2002) proposes that in order to facilitate focused goal pursuit, the BAS inhibits BIS-mediated processes associated with sensitivity to negative outcomes and reactivity to aversive events. Consistent with this, approach-motivation-related traits (Higgins, 1998), patterns of brain activity (Nash et al., 2012), and emotions (Lang, 1995) antagonize sensitivity to aversive stimuli. Although much research has focused on the interplay between approach and aversive motivation systems, future research could examine whether reactive risk-taking specifically is a consequence of inhibited BIS-related sensitivity to negative outcomes, enhanced BAS-related sensitivity to positive outcomes, or a combination of the two.

Second, it may be that BIS-inspired anxiety persisted from the onset of the anxiety prime (in Study 1) until participants were offered a concrete incentive to approach, e.g., risk-taking on the BART. Thus, risk-taking might itself offer relief. Alternatively, it is possible that participants in this sample activated free-floating, palliative approach-motivated states immediately following the anxiety prime, perhaps by pursuing abstract ideals in the privacy of their own minds, which incidentally caused eager and disinhibited risk-taking on the BART. Consistent with this account of reactive risk-taking, a variety of discrete anxious experiences, including those used in the present research, cause increased conviction for personal and group ideals (reviewed in McGregor et al., 2013). Further, imagined ideals and strongly held convictions trigger approach-motivated states (Harmon-Jones, 2004; Jonas et al., 2014; Urry et al., 2004) and buffer against anxiety (Creswell et al., 2005; Inzlicht et al., 2009). Prior theorizing on RAM also supports this account. Recall that the RAM model proposes a basic shift from BIS-mediated anxious arousal to BAS-mediated approach-oriented reactions (Jonas et al., 2014). Critically, however, the model posits that individual levels of trait approach motivation moderate how quickly people shift from anxiety to approach-oriented states. In support of this idea, recall the unpublished study from our lab found that an anxiety manipulation (vs. control) caused *immediate* approach-related affect among trait approach-motivated participants. However, I did not assess whether this approach-oriented state had downstream effects on risk-taking. Future research could investigate whether reactive risk-taking is a distinct RAM response in and of itself, or merely a by-product of preceding and free-floating RAM.

Finally, the present research focused on how trait approach-motivated individuals specifically respond to anxious experiences with respect to risk-taking behavior. However, people display significant heterogeneity in how they respond to anxiety as well as in how they address risk. For example, some individuals respond to anxiety with withdrawal, reduced approach motivation, and increased avoidance motivation (Hayes et al., 2016; Park, 2010), responses that have been linked to risk aversion in past research (e.g., Friedman & Förster, 2002). For some, avoidance motivation may afford relief from anxious worry by providing security from uncertainty via the prevention of negative outcomes. This increased sensitivity to negative outcomes may in turn leave individuals less likely to engage in risk-taking behavior. Though substantial research has examined the link between avoidance motivation and risk-aversion, research investigating avoidance-motivated reactions to anxiety and their downstream consequences on risk-taking are limited. Future research could examine this possibly, particularly among less secure individuals (e.g., low self-esteem, insecurely attached), who may lack the self-confidence to respond to anxious experiences with unbridled approach motivation (Park, 2010).

Conclusion

The present research demonstrates that anxious experiences can cause approach-motivated individuals to engage in RAM, leaving them prone to eager, reactive risk-taking behavior. These findings contribute to the evolving recognition that incidental emotions and motivation play important roles in risk decisions. Importantly, this research may offer a potential insight into approaches that may reduce certain pathological instances of reactive risk-taking, such as problem gambling. For example, one could pursue anxiolytic interventions to reduce problem risk-taking. Anxiolytic drugs, such as selective serotonin reuptake inhibitors (SSRIs), have proven to be effective in the treatment of problem gambling (Hollander et al., 2000). Anxiolytic interventions may be especially important as problem gambling tends to be comorbid with anxiety disorders (Lloyd et al., 2010). Alternatively, if unrelated, incidental anxieties are provoking instances of problem risk-taking, then one may be able to curb this behavior by addressing the source of the anxiety directly. Simple social psychological interventions may also prove effective in combatting reactive risk-taking. For example, self-affirming personal values may buffer against the adverse effects of anxiety (Creswell et al., 2005) and, consequently, reduce the propensity for reactive risk-taking. Likewise, attributing the symptoms of anxiety, such as arousal, to external sources may also relieve anxious unease and protect against risk-seeking propensity (Nash et al., 2011; Proulx & Heine, 2008). Today, widespread economic anxiety looms amid the COVID-19 pandemic (Fetzer et al., 2020) and, unlike the final seconds of a football game, the optimal decision is often not the desperation "Hail Mary". By acknowledging the emotional, motivational, and psychological processes underlying reactive risk-taking, people can more effectively navigate through real-world anxieties to make rational, utilitarian decisions.

References

Aberson, C. L. (2019). *Applied power analysis for the behavioral sciences*. New York: Routledge, Taylor & Francis Group.

Amodio, D. M., Shah, J. Y., Sigelman, J., Brazy, P. C., & Harmon-Jones, E. (2004). Implicit regulatory focus associated with asymmetrical frontal cortical activity. *Journal of Experimental Social Psychology*, *40*(2), 225-232. https://doi.org/10.1016/S0022-1031(03)00100-8

Anderson, C., & Galinsky, A. D. (2006). Power, optimism, and risk taking. *European Journal of Social Psychology, 36*(4), 511-536. https://doi.org/10.1002/ejsp.324

Ayton, P., & Fischer, I. (2004). The hot hand fallacy and the gambler's fallacy: Two faces of subjective randomness?. *Memory & Cognition*, *32*(8), 1369-1378. https://doi.org/10.3758/BF03206327

Baumeister, R. F., Tice, D. M., & Hutton, D. G. (1989). Self-presentational motivations and personality differences in self-esteem. *Journal of personality*, *57*(3), 547-579. https://doi.org/10.1111/j.1467-6494.1989.tb02384.x

Boksem, M. A., Tops, M., Kostermans, E., & De Cremer, D. (2008). Sensitivity to punishment and reward omission: evidence from error-related ERP components. *Biological Psychology*, *79*(2), 185-192. https://doi.org/10.1016/j.biopsycho.2008.04.010

Bower, G. H. (1991). Mood congruity of social judgment. In J. Forgas (Ed.), *Emotion and Social Judgments* (pp. 31-54). Oxford, England: Pergamon Press.

Bryant, F. B., & Smith, B. D. (2001). Refining the architecture of aggression: A measurement model for the Buss–Perry Aggression Questionnaire. *Journal of Research in Personality*, *35*(2), 138-167. https://doi.org/10.1006/jrpe.2000.2302

Burns, B. D., & Corpus, B. (2004). Randomness and inductions from streaks: "Gambler's fallacy" versus" hot hand ". *Psychonomic Bulletin & Review*, *11*(1), 179-184. https://doi.org/10.3758/BF03206480

Carver, C. S., & Harmon-Jones, E. (2009). Anger is an approach-related affect: evidence and implications. *Psychological Bulletin*, *135*(2), 183. https://doi.org/10.1037/a0013965

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. *Journal of Personality and Social Psychology*, *67*(2), 319.

Castano, E., Yzerbyt, V., Paladino, M. P., & Sacchi, S. (2002). I belong, therefore, I exist: Ingroup identification, ingroup entitativity, and ingroup bias. *Personality and Social Psychology Bulletin*, *28*(2), 135-143. https://doi.org/10.1177/0146167202282001

Cavallo, J. V., Fitzsimons, G. M., & Holmes, J. G. (2009). Taking chances in the face of threat: Romantic risk regulation and approach motivation. *Personality and Social Psychology Bulletin, 35*, 737–751. https://doi.org/10.1177/0146167209332742

Coan, J. A., & Allen, J. J. (2004). Frontal EEG asymmetry as a moderator and mediator of emotion. *Biological Psychology*, *67*(1-2), 7-50. https://doi.org/10.1016/j.biopsycho.2004.03.002

Community and Public Health. (2012, December 1). *Christchurch City Health Profile: Problem Gambling* [press release]. https://www.healthychristchurch.org.nz/media/34858/problemgambling.pdf

Corr, P. J. (2002). J.A. Gray's reinforcement sensitivity theory: Tests of the joint subsystems hypothesis of anxiety and impulsivity. *Personality and Individual Differences, 33*, 511–532. https://doi.org/10.1016/S0191-8869(01)00170-2

Corr, P. J. (2008). *The reinforcement sensitivity theory of personality*. Cambridge University Press, Cambridge.

Creswell, J. D., Welch, W. T., Taylor, S. E., Sherman, D. K., Gruenewald, T. L., & Mann, T. (2005). Affirmation of personal values buffers neuroendocrine and psychological stress responses. *Psychological Science*, *16*(11), 846-851. https://doi.org/10.1111/j.1467-9280.2005.01624.x

Demaree, H. A., DeDonno, M. A., Burns, K. J., Feldman, P., & Everhart, D. E. (2009). Trait dominance predicts risk-taking. *Personality and Individual Differences, 47*(5), 419–422. https://doi.org/10.1016/j.paid.2009.04.013

De Dreu, C. K., Nijstad, B. A., & Baas, M. (2011). Behavioral activation links to creativity because of increased cognitive flexibility. *Social Psychological and Personality Science*, *2*(1), 72-80. https://doi.org/10.1177/1948550610381789

DeSteno, D., Petty, R. E., Wegener, D. T., & Rucker, D. D. (2000). Beyond valence in the perception of likelihood: the role of emotion specificity. *Journal of Personality and Social Psychology*, *78*(3), 397-416. https://doi.org/10.1037/0022-3514.78.3.397

Dula, C. S., Adams, C. L., Miesner, M. T., & Leonard, R. L. (2010). Examining relationships between anxiety and dangerous driving. *Accident Analysis & Prevention*, *42*(6), 2050-2056. https://doi.org/10.1016/j.aap.2010.06.016

Elliot, A. J. (2008). *Handbook of approach and avoidance motivation.* Psychology Press, New York.

Fetzer, T., Hensel, L., Hermle, J., & Roth, C. (2020). Coronavirus perceptions and economic anxiety. *Review of Economics and Statistics*, 1-36. https://doi.org/10.1162/rest_a_00946

Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin, 117*, 39-66. https://doi.org/10.1037/0033-2909.117.1.39

Fowles, D. C. (1980). The three arousal model: Implications of Gray's two-factor learning theory for heart rate, electrodermal activity, and psychopathy. *Psychophysiology*, *17*(2), 87-104. https://doi.org/10.1111/j.1469-8986.1980.tb00117.x

Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). An item response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology*, *78*(2), 350-365. https://doi.org/10.1037/0022-3514.78.2.350

Friedman, R. S., & Förster, J. (2002). The influence of approach and avoidance motor actions on creative cognition. *Journal of Experimental Social Psychology*, *38*(1), 41-55. https://doi.org/10.1006/jesp.2001.1488

Gable, P. A., & Harmon-Jones, E. (2008). Approach-motivated positive affect reduces breadth of attention. *Psychological Science*, *19*(5), 476-482. https://doi.org/10.1111/j.1467-9280.2008.02112.x

Garvey, R., Murphy, A., & Wu, F. (2007). Do Losses Linger?. *The Journal of Portfolio Management, 33*, 75-83. https://doi.org/10.3905/jpm.2007.690608

Gianotti, L. R. R., Knoch, D., Faber, P. L., Lehmann, D., Pascual-Marqui, R. D., Diezi, C., . . . Fehr, E. (2009). Tonic activity level in the right prefrontal cortex predicts individuals' risk taking. *Psychological Science, 20*, 33–38. https://doi.org/10.1111/j.1467-9280.2008.02260.x

Gosling, S. D., Rentfrow, P. J., & Swann Jr, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*(6), 504-528. https://doi.org/10.1016/S0092-6566(03)00046-1

Gray, J. A. & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system*. New York: Oxford University Press.

Greco, V., & Roger, D. (2001). Coping with uncertainty: The construction and validation of a new measure. *Personality and Individual Differences*, *31*(4), 519-534. https://doi.org/10.1016/S0191-8869(00)00156-2

Harmon-Jones, E. (2004). Contributions from research on anger and cognitive dissonance to understanding the motivational functions of asymmetrical frontal brain activity. *Biological Psychology*, *67*(1-2), 51-76. https://doi.org/10.1016/j.biopsycho.2004.03.003

Harmon-Jones, E., & Harmon-Jones, C. (2008). Action-based model of dissonance: A review of behavioral, anterior cingulate and prefrontal cortical mechanisms. *Social and Personality Psychology Compass, 2/3*, 1518-1538. https://doi.org/10.1111/j.1751-9004.2008.00110.x

Harmon-Jones, C., Schmeichel, B. J., Inzlicht, M., & Harmon-Jones, E. (2011). Trait approach motivation relates to dissonance reduction. *Social Psychological and Personality Science*, *2*(1), 21-28. https://doi.org/10.1177/1948550610379425

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach.* New York, NY: Guilford Press.

Hayes, J., Ward, C. L., & McGregor, I. (2016). Why bother? Death, failure, and fatalistic withdrawal from life. *Journal of Personality and Social Psychology*, *110*(1), 96-115. https://doi.org/10.1037/pspp0000039

Heimpel, S. A., Elliot, A. J., & Wood, J. V. (2006). Basic personality dispositions, self-esteem, and personal goals: An approach-avoidance analysis. *Journal of Personality*, *74*(5), 1293-1320. https://doi.org/10.1111/j.1467-6494.2006.00410.x

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist, 52*, 1280–1300. https://doi.org/10.1037/0003-066X.52.12.1280

Higgins, E. T. (1998). Promotion and prevention: Regulatory focus as a motivational principle. *Advances in Experimental Social Psychology, 30*, 1-46. https://doi.org/10.1016/S0065-2601(08)60381-0

Higgins, E. T., Friedman, R. S., Harlow, R. E., Idson, L. C., Ayduk, O. N., & Taylor, A. (2001). Achievement orientations from subjective histories of success: Promotion pride versus prevention pride. *European Journal of Social Psychology*, *31*(1), 3-23. https://doi.org/10.1002/ejsp.27

Hirsh, J. B., Mar, R. A., & Peterson, J. B. (2012). Psychological entropy: A framework for understanding uncertainty-related anxiety. *Psychological Review, 119*, 304. https://doi.org/10.1037/a0026767

Hollander, E., DeCaria, C. M., Finkell, J. N., Begaz, T., Wong, C. M., & Cartwright, C. (2000). A randomized double-blind fluvoxamine/placebo crossover trial in pathologic gambling. *Biological Psychiatry*, *47*(9), 813-817. https://doi.org/10.1016/S0006-3223(00)00241-9

Isen, A. M., Nygren, T. E., & Ashby, F. G. (1988). Influence of positive affect on the subjective utility of gains and losses: It is just not worth the risk. *Journal of Personality and Social Psychology, 55*(5), 710–717. https://doi.org/10.1037/0022-3514.55.5.710

Isen, A. M., & Patrick, R. (1983). The effect of positive feelings on risk taking: When the chips are down. *Organizational Behavior and Human Performance*, *31*(2), 194-202. https://doi.org/10.1016/0030-5073(83)90120-4

Isen, A. M., Shalker, T. E., Clark, M., & Karp, L. (1978). Affect, accessibility of material in memory, and behavior: A cognitive loop? *Journal of Personality and Social Psychology, 36*, 1-12. https://doi.org/10.1037/0022-3514.36.1.1

Jackson, D. C., Mueller, C. J., Dolski, I., Dalton, K. M., Nitschke, J. B., Urry, H. L., ... & Davidson, R. J. (2003). Now you feel it, now you don't: Frontal brain electrical asymmetry and individual differences in emotion regulation. *Psychological Science*, *14*(6), 612-617. https://doi.org/10.1046/j.0956-7976.2003.psci_1473.x

Johnson, E. J., & Tversky, A. (1983). Affect, generalization, and the perception of risk. *Journal of Personality and Social Psychology, 45*, 20-31. https://doi.org/10.1037/0022-3514.45.1.20

Jonas, E., & Fritsche, I. (2013). Destined to die but not to wage war: How existential threat can contribute to escalation or de-escalation of violent intergroup conflict. *American Psychologist*, *68*(7), 543-558. https://doi.org/10.1037/a0033052

Jonas, E., McGregor, I., Klackl, J., Agroskin, D., Fritsche, I., Holbrook, C., ... & Quirin, M. (2014). Threat and defense: From anxiety to approach. In *Advances in Experimental*

Social Psychology. (Vol. 49, pp. 219-286). Academic Press. https://doi.org/10.1016/B978-0-12-800052-6.00004-4

Jorm, A. F., Christensen, H., Henderson, A. S., Jacomb, P. A., Korten, A. E., & Rodgers, B. (1998). Using the BIS/BAS scales to measure behavioural inhibition and behavioural activation: Factor structure, validity and norms in a large community sample. *Personality and Individual Differences*, *26*(1), 49-58. https://doi.org/10.1016/S0191-8869(98)00143-3

Kahneman, D., Slovic, S. P., Slovic, P., & Tversky, A. (Eds.). (1982). *Judgment under uncertainty: Heuristics and biases*. Cambridge university press.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263-291.

Kasser, T., & Sheldon, K. M. (2000). Of wealth and death: Materialism, mortality salience, and consumption behavior. *Psychological Science*, *11*(4), 348-351. https://doi.org/10.1111/1467-9280.00269

Kestenbaum, D. (2006). Economists Learn from Game Show 'Deal or No Deal'. March 28th, 2012. http://www.npr.org/templates/story/story.php?storyId=5244516

Kim, D. Y., & Lee, J. H. (2011). Effects of the BAS and BIS on decision-making in a gambling task. *Personality and Individual Differences*, *50*(7), 1131-1135. https://doi.org/10.1016/j.paid.2011.01.041

Knoch, D., Gianotti, L.R.R., Pascual-Leone, A., Treyer, V., Regard, M., Hohmann, M., and Brugger, P. (2006). Disruption of right prefrontal cortex by low-frequency repetitive transcranial magnetic stimulation induces risk-taking behavior. *Journal of Neuroscience, 26*, 6469–6472. https://doi.org/10.1523/JNEUROSCI.0804-06.2006

Knutson, B., & Greer, S.M. (2008). Anticipatory affect: Neural correlates and consequences for choice. *Philosophical Transactions of the Royal Society B, 363*(1511), 3771–3786. https://doi.org/10.1098/rstb.2008.0155

Kumar, A. (2009). Who gambles in the stock market?. *The Journal of Finance*, *64*(4), 1889-1933. https://doi.org/10.1111/j.1540-6261.2009.01483.x

Kusev, P., Purser, H., Heilman, R., Cooke, A. J., Van Schaik, P., Baranova, V., ... & Ayton, P. (2017). Understanding risky behavior: the influence of cognitive, emotional and hormonal factors on decision-making under risk. *Frontiers in Psychology*, *8*, 102. https://doi.org/10.3389/fpsyg.2017.00102

Lang, P. J. (1995). The emotion probe: studies of motivation and attention. *American Psychologist*, *50*(5), 372-385. https://doi.org/10.1037/0003-066X.50.5.372

Larsen, R. J., & Ketelaar, T. (1989). Extraversion, neuroticism and susceptibility to positive and negative mood induction procedures. *Personality and Individual Differences*, *10*(12), 1221-1228. http://dx.doi.org/10.1016/0191-8869(89)90233-X

Larsen, R. J., & Ketelaar, T. (1991). Personality and susceptibility to positive and negative emotional states. *Journal of Personality and Social Psychology*, *61*(1), 132-140. https://doi.org/10.1037/0022-3514.61.1.132

Lejuez, C. W., Read, J. P., Kahler, C. W., Richards, J. B., Ramsey, S. E., Stuart, G. L., ... & Brown, R. A. (2002). Evaluation of a behavioral measure of risk taking: the Balloon

Analogue Risk Task (BART). *Journal of Experimental Psychology: Applied*, *8*(2), 75. https://doi.org/10.1037/1076-898X.8.2.75

Leonardelli, G. J., Lakin, J. L., & Arkin, R. M. (2007). A regulatory focus model of self-evaluation. *Journal of Experimental Social Psychology*, *43*(6), 1002-1009. https://doi.org/10.1016/j.jesp.2006.10.021

Lerner, J. S., & Keltner, D. (2000). Beyond valence: Toward a model of emotion-specific influences on judgement and choice. *Cognition & Emotion*, *14*, 473–493.

Lerner, J. S., & Keltner, D. (2001). Fear, anger, and risk. *Journal of Personality and Social Psychology, 81*(1), 146–159. https://doi.org/10.1037/0022-3514.81.1.146

Lockwood, P., Jordan, C. H., & Kunda, Z. (2002). Motivation by positive or negative role models: regulatory focus determines who will best inspire us. *Journal of Personality and Social Psychology*, *83*(4), 854-864. https://doi.org/10.1037/0022-3514.83.4.854

Loewenstein, G., and Lerner, J. (2003). "The role of affect in decision making," in *Handbook of Affective Science*, eds R. Davidson, K. Sherer, and H. Goldsmith (Oxford: Oxford University Press), 619–642.

Loewenstein, G., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*, 267–286. https://doi.org/10.1037/0033-2909.127.2.267

Lloyd, J., Doll, H., Hawton, K., Dutton, W. H., Geddes, J. R., Goodwin, G. M., & Rogers, R. D. (2010). How psychological symptoms relate to different motivations for gambling: An online study of internet gamblers. *Biological Psychiatry, 68*, 733-740. https://doi.org/10.1016/j.biopsych.2010.03.038

Maner, J. K., & Gerend, M. A. (2007). Motivationally selective risk judgments: Do fear and curiosity boost the boons or the banes?. *Organizational Behavior and Human Decision Processes*, *103*(2), 256-267. https://doi.org/10.1016/j.obhdp.2006.08.002

Maner, J. K., & Schmidt, N. B. (2006). The role of risk avoidance in anxiety. *Behavior Therapy*, *37*(2), 181-189. https://doi.org/10.1016/j.beth.2005.11.003

May, C. N., Juergensen, J., & Demaree, H. A. (2016). Yum, cake!: How reward sensitivity relates to automatic approach motivation for dessert food images. *Personality and Individual Differences*, *90*, 265-268. https://doi.org/10.1016/j.paid.2015.11.022

McGregor, H. A., Lieberman, J. D., Greenberg, J., Solomon, S., Arndt, J., Simon, L., & Pyszczynski, T. (1998). Terror management and aggression: evidence that mortality salience motivates aggression against worldview-threatening others. *Journal of Personality and Social Psychology*, *74*(3), 590-605. https://doi.org/10.1037/0022-3514.74.3.590

McGregor, I., Gailliot, M. T., Vasquez, N. A., & Nash, K. A. (2007). Ideological and personal zeal reactions to threat among people with high self-esteem: Motivated promotion focus. *Personality and Social Psychology Bulletin, 33*, 1587–1599. https://doi.org/10.1177/0146167207306280

McGregor, I., Haji, R., Nash, K. A., & Teper, R. (2008). Religious zeal and the uncertain self. *Basic and Applied Social Psychology*, *30*(2), 183-188. https://doi.org/10.1080/01973530802209251

McGregor, I., & Jordan, C. H. (2007). The mask of zeal: Low implicit self-esteem, threat, and defensive extremism. *Self and Identity, 6*, 223–237. https://doi.org/10.1080/15298860601115351

McGregor, I., Nail, P. R., Marigold, D. C., & Kang, S. J. (2005). Defensive pride and consensus: strength in imaginary numbers. *Journal of Personality and Social Psychology*, *89*(6), 978. https://doi.org/10.1037/0022-3514.89.6.978

McGregor, I., Nash, K. A., & Inzlicht, M. (2009a). Threat, high self-esteem, and reactive approach-motivation: Electroencephalographic evidence. *Journal of Experimental Social Psychology, 45*, 1003–1007. https://doi.org/10.1016/j.jesp.2009.04.011

McGregor, I., Nash, K., Mann, N., & Phills, C. E. (2010a). Anxious uncertainty and reactive approach motivation (RAM). *Journal of Personality and Social Psychology, 99*, 133–147. https://doi.org/10.1037/a0019701

McGregor, I., Nash, K., & Prentice, M. (2010b). Reactive approach motivation (RAM) for religion. *Journal of Personality and Social Psychology, 99*, 148–161. https://doi.org/10.1037/a0019702

McGregor, I., Prentice, M. S., & Nash, K. A. (2009b). Personal uncertainty management by reactive approach motivation. *Psychological Inquiry*, *20*(4), 225-229. https://doi.org/10.1080/10478400903333460

McPherson, S., & Joireman, J. (2009). Death in groups: Mortality salience and the interindividual-intergroup discontinuity effect. *Group Processes & Intergroup Relations*, *12*(4), 419-429. https://doi.org/10.1177/1368430209105044

Mohr, P., Biele, G., & Heekeren, H. (2010). Neural processing of risk. *Journal of Neuroscience, 30*, 6613-6619. https://doi.org/10.1523/JNEUROSCI.0003-10.2010

Nash, K., Inzlicht, M., & McGregor, I. (2012). Prefrontal EEG asymmetry characteristic of approach motivation predicts muted error-related negativity. *Biological Psychology, 91*, 96-102. https://doi.org/10.1016/j.biopsycho.2012.05.005

Nash, K., McGregor, I., & Inzlicht, M. (2010). Line bisection as a neural marker of approach motivation. *Psychophysiology, 47*, 979–983. https://doi.org/10.1111/j.1469-8986.2010.00999.x

Nash, K., McGregor, I., & Prentice, M. (2011). Threat and defense as goal regulation: From implicit goal conflict to anxious uncertainty, reactive approach motivation, and ideological extremism. *Journal of Personality and Social Psychology, 101*, 1291–1301. https://doi.org/10.1037/a0025944

Norris, P., Pacini, R., & Epstein, S. (1998). *The Rational-Experiential Inventory, short form*. Amherst, MA: University of Massachusetts.

O'Connor, R. M., Stewart, S. H., & Watt, M. C. (2009). Distinguishing BAS risk for university students' drinking, smoking, and gambling behaviors. *Personality and Individual Differences*, *46*(4), 514-519. https://doi.org/10.1016/j.paid.2008.12.002

Park, L. E. (2010). Responses to self-threat: Linking self and relational constructs with approach and avoidance motivation. *Social and Personality Psychology Compass*, *4*(3), 201-221. https://doi.org/10.1111/j.1751-9004.2009.00247.x

Platt, M. L., & Huettel, S. A. (2008). Risky business: the neuroeconomics of decision making under uncertainty. *Nature Neuroscience*, *11*(4), 398-403. https://doi.org/10.1038/nn2062

Post, T., Van den Assem, M. J., Baltussen, G., & Thaler, R. H. (2008). Deal or no deal? decision making under risk in a large-payoff game show. *American Economic Review*, *98*(1), 38-71. https://doi.org/10.1257/aer.98.1.38

Proulx, T., Inzlicht, M., & Harmon-Jones, E. (2012). Understanding all inconsistency compensation as a palliative response to violated expectations. *Trends in cognitive sciences*, *16*(5), 285-291. https://doi.org/10.1016/j.tics.2012.04.002

Proulx, T., & Heine, S. J. (2008). The case of the transmogrifying experimenter: Affirmation of a moral schema following implicit change detection. *Psychological Science*, *19*(12), 1294-1300. https://doi.org/10.1111/j.1467-9280.2008.02238.x

Pyszczynski, T., Abdollahi, A., Solomon, S., Greenberg, J., Cohen, F., & Weise, D. (2006). Mortality salience, martyrdom, and military might: The great Satan versus the axis of evil. *Personality and Social Psychology Bulletin*, *32*(4), 525-537.

R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Santesso, D. L., & Segalowitz, S. J. (2009). The error-related negativity is related to risk taking and empathy in young men. *Psychophysiology, 46*, 143-152. https://doi.org/10.1111/j.1469-8986.2008.00714.x

Schwarzer, R., & Jerusalem, M. (1995). Self-efficacy measurement: Generalized self-efficacy scale (GSES). In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio* (pp. 35–37). Windsor, England: NFER-Nelson.

Shackman, A. J., McMenamin, B. W., Maxwell, J. S., Greischar, L. L., & Davidson, R. J. (2009). Right dorsolateral prefrontal cortical activity and behavioral inhibition. *Psychological Science*, *20*(12), 1500-1506. https://doi.org/10.1111/j.1467-9280.2009.02476.x

Scholer, A. A., Zou, X., Fujita, K., Stroessner, S. J., & Higgins, E. T. (2010). When risk seeking becomes a motivational necessity. *Journal of Personality and Social Psychology*, *99*(2), 215-231. https://doi.org/10.1037/a0019715

Smillie, L. D., & Jackson, C. J. (2005). The appetitive motivation scale and other BAS measures in the prediction of approach and active avoidance. *Personality and Individual Differences*, *38*(4), 981-994. https://doi.org/10.1016/j.paid.2004.09.013

Smith, G., Levere, M., & Kurtzman, R. (2009). Poker player behavior after big wins and big losses. *Management Science, 55*, 1547-1555. https://doi.org/10.1287/mnsc.1090.1044

Spencer, S. J., Zanna, M. P., & Fong, G. T. (2005). Establishing a causal chain: why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Psychology*, *89*(6), 845. https://doi.org/10.1037/0022-3514.89.6.845

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, *72*(2), 271-324. https://doi.org/10.1111/j.0022-3506.2004.00263.x

Thaler, R. (1985). Mental accounting and consumer choice. *Marketing Science*, *4*(3), 199-214. https://doi.org/10.1287/mksc.4.3.199

Thaler, R. H., & Johnson, E. J. (1990). Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management Science*, *36*(6), 643-660. https://doi.org/10.1287/mnsc.36.6.643

Tversky, A., & Kahneman, D. (1971). Belief in the law of small numbers. *Psychological Bulletin*, *76*(2), 105-110. https://doi.org/10.1037/h0031322

Urry, H. L., Nitschke, J. B., Dolski, I., Jackson, D. C., Dalton, K. M., Mueller, C. J., ... & Davidson, R. J. (2004). Making a life worth living: Neural correlates of well-being. *Psychological Science*, *15*(6), 367-372. https://doi.org/10.1111/j.0956-7976.2004.00686.x

Zhang, S., Cornwell, J. F., & Higgins, E. T. (2014). Repeating the past: Prevention focus motivates repetition, even for unethical decisions. *Psychological Science*, *25*(1), 179-187. https://doi.org/10.1177/0956797613502363

Zou, X., & Scholer, A. A. (2016). Motivational affordance and risk-taking across decision domains. *Personality and Social Psychology Bulletin*, *42*(3), 275-289. https://doi.org/10.1177/0146167215626706

Zou, X., Scholer, A. A., & Higgins, E. T. (2014). In pursuit of progress: Promotion motivation and risk preference in the domain of gains. *Journal of Personality and Social Psychology*, *106*(2), 183-201. https://doi.org/10.1037/a0035391

Zuckerman, M., & Kuhlman, D. M. (2000). Personality and risk-taking: Common biosocial factors. *Journal of Personality, 68*, 999–1029. https://doi.org/10.1111/1467-6494.00124

Appendix A

Achievement Anxiety Manipulation (Study 1)

The Structural Equation Model

The structural equation model refers to relations among exogenous and endogenous variables. Most often, these variables are constructs and therefore are unobserved. Such variables are also referred to as latent, or true, variables. Latent variables are frequently encountered in the social sciences.

In fact, constructs such as intelligence, motivation, attitudes, ambition, anxiety, aspirations, and cognitive styles play a crucial role in the social sciences and in social science research. In LISREL, latent dependent, or endogenous, variables are designated as n (eta), whereas latent independent, or exogenous, variables are designated as ξ (xi).

The structural equation model is: $Bn = r\,\xi + \zeta$

Where n (eta) is an m by 1 vector of latent endogenous variables; ξ (xi) is an n by 1 vector of latent exogenous variables; B (beta) is an m by m matrix of coefficients of the effects of endogenous on endogenous variables; r (gamma) is an m by n matrix of coefficients of the effects of exogenous variables (ξ's) on endogenous variables (n's); ζ (zeta) is an m by 1 vector of residuals, or errors in equations.

It is assumed that the means of all the variables are equal to zero – that is, that the variables are expressed in deviation scores. Also, it is assumed that ζ and ξ are uncorrelated, and that B is nonsingular.

The Measurement Model

The measurement model specifies the relations between unobserved and observed, or latent and manifest, variables. Two equations describe this model. The first is: $y = \Lambda yn + \epsilon$
Where y is a p by 1 vector of measures of dependent variables; Λ (lambda) is a p by m matrix of coefficients, or loadings, of y on the unobserved dependent variables (n); ϵ (epsilon) is a p by 1 vector of errors of measurement of y.

The second is: $x = \Lambda r\xi + \delta$

Where x is a q by 1 vector of measures of independent variables; Λ (lambda) is a q by n matrix of coefficients, or loadings, of x on the unobserved independent variables (ξ); and δ (delta) is a q by 1 vector of errors of measurement of x.

Appendix B

Achievement Control Manipulation (Study 1)

Decisions, Decisions, Decisions!

Life places many demands upon us, and one of them is the burden of making decisions that affect our lives and careers. On an abstract level, controlling one's destiny through the decision-making process should be a fulfilling and enjoyable experience. On a more realistic level, however, it often seems that we don't have enough information or the right kinds of information available when we are faced with making an important decision.

Because some decisions cannot be put off and because of demands that are placed upon us and that we place on ourselves, some decisions are inevitably made in the face of substantial uncertainty—without all the relevant information and with incomplete understanding of the information we do have.

Before we make decisions that affect us personally, we tend to gather as much relevant information as possible. By making a decision based upon information rather than on impulse, we can minimize any uncertainty we may have about the correctness of the decision. In science, the goal is fundamentally the same. To minimize uncertainty and maximize the availability of relevant information, scientists collect data (measurements from observations that are usually recorded using numbers). Whether in the context of formal research activity ("Is this advertising campaign working?") or our personal lives ("Where should I go to college?") the goal is to make as informed a decision as possible, backed up with as much relevant data as we can collect.

In a formal research setting, data are carefully collected under controlled conditions so that they will hold the promise of containing needed information. As sound and potentially valuable as data may be, however, they will not yield their information without a struggle. Information is coy. It likes to disguise itself and stay hidden in a jumble of numbers. We have to flush it out into the open using special tools—the tools that comprise statistical analysis.

By subjecting the data to formal computational procedures, we can distill the information that is in the data into forms that can be assimilated, understood, communicated, and used for practical purposes. Without the organizing and summarizing of information that is accomplished by statistical analysis, we would tend to be overwhelmed and confused—aimlessly adrift in a sea of numbers.

To understand the role of statistical analysis as an information-gathering tool, it helps to regard the numerical representation of data as a code. If numbers are the coded representations of our observations, we need to crack the code to make available all the information the numbers hold The techniques of descriptive statistics are, in a sense, decoding devices that pull the information from the data and allow us to see properties and relationships that could otherwise go unnoticed.

Appendix C

Economic Anxiety Manipulation (Study 2)

TORONTO—Leading economists at University of Toronto paint an unsettling economic picture for Canadians. Although the Canadian economy may appear stable, there are ominous indicators that this false recovery will soon give way to an economic collapse.

The University of Toronto economists say that wage stagnation, declining job quality, and fewer long-term employment opportunities all signal trouble, particularly for the university graduates. Even now, those who are employed are working longer hours for less pay, while still struggling to secure basic necessities like food, shelter, gas, and medical supplies. Economic red flags suggest that these problems will spread and that the financial conditions of young Canadians over the next 10 years are likely to worsen. Unemployment rates have risen significantly, with university graduates bearing the brunt, juggling historic levels of student debt. A 2018 Ipsos poll found that more than 75 per cent of Canadian graduates under the age of 40 regret taking on student debt.

Robert Mundell, Nobel prize winner and professor of economics, cites new technology and income inequality as factors suppressing wages for Canadians. According to Mundell, computerization threatens to put a substantial percentage of the current labour force out of work over the next 10 years. Additionally, Mundell points out that Canada has one of the highest levels of income inequality among big, rich countries. Mundell worries that the Canadian economy is "enriching the few at the expense of the many", which in turn "is making a mockery of democracy". Such levels of income inequality are a strong indication that an impending economic recession is likely.

The Toronto economists link the rising rates of depression, anxiety, and drug and alcohol abuse among Canadian workers, with growing economic insecurity, income stagnation, and wealth inequality. It is likely working Canadians are faced with an uncertain path moving forward.

Appendix D

Economic Control Manipulation (Study 2)

TORONTO—A high profile report released by leading economists at University of Toronto paints a reassuring economic picture for Canadians. The report argues that the Canadian economy is recovering from the recent economic downturn and that there are indicators that this recovery will be stable.

In 2016, Federal Reserve officials worried that banks would go bankrupt, but new regulations similar to those already in place in countries like Canada have now attenuated that risk. Businesses benefited from the recent downturn by becoming more competitive, and this will continue to pay economic dividends over the next 10 years. Global business leaders are once again earning profits. The G20 countries' recent agreement to slash their deficits will improve global economic conditions by stimulating the economy and creating jobs for Canadians. Statistics Canada, Canada’s national statistical agency, reported on Wednesday that income inequality has reached its lowest point in the last 30 years. Both unemployment rates and student debt are at a record low, suggesting an easier transition into the labour force for university graduates as well as those looking to re-enter the employment market.

In sum, the report projects economic stability in Canada, and that Canada is well positioned because its economy is based on export industries that are in demand during such periods of stability. University graduates entering the job market for the first time will have employment opportunities. The report concludes that, "In addition to the adequate levels of employment that will occur as a result of the predicted stability, prices of basic necessities like food, shelter, gas and medical supplies will remain affordable."