2021

Factors that Influence Whether Choices are Consistent with Loss Aversion

Julian Kafka
University of Vermont

Factors that Influence Whether Choices are Consistent with Loss Aversion

Julian Kafka

In Partial Fulfillment of the Requirements for Graduation from the Honors College with a Bachelor of Arts in Psychological Science

University of Vermont 2021 College of Arts and Sciences

University of Vermont Committee:

Eric A. Thrailkill, Ph.D.

Mark Bouton, Ph.D.

Jeremy Sibold, Ed.D.

Abstract

Research suggests that decision making is an important, often-overlooked determinant of human health. Loss aversion describes the propensity to prefer avoiding losses over obtaining equivalent gains. Risk aversion denotes the tendency to avoid options that entail a risk of loss when choosing between alternatives. In two experiments, I examined loss aversion and other decision-making variables. In Experiment 1, club sport athletes and non-athletes at the University of Vermont completed measures of loss aversion, risk aversion, delay discounting, and probability discounting. Groups were compared to assess the hypothesis that athletes are less loss averse and risk averse than non-athletes. The results suggest that the populations do not differ in their levels of delay or probability discounting. Athletes were slightly less loss averse than non-athletes, but this difference was not statistically significant. However, athletes were significantly less risk averse than non-athletes. Experiment 2 examined predictions of loss aversion for different conditions in which the expected values of each choice were manipulated. Two groups received three blocks consisting of 64 hypothetical 50-50 gambles that each presented a potential gain and a potential loss. Participants chose to accept or reject the gamble. For the AAA group, gains ranged from $12 to $40, and losses ranged from $6 to $20 in all three phases. The ABA group experienced the same ranges in Phases 1 and 3, but the ranges were reversed in Phase 2. I hypothesized that the participants' choices would be sensitive to the expected value of the gambles and that, independent of the expected value, they would accept gambles in a manner consistent with loss aversion. The results supported my hypotheses. Loss aversion was observed at each test block; however, groups differed systematically in how well their choices matched the predictions of loss aversion. Overall, the results provide new information on the influence of experience on decision making.

The United States spends more money on healthcare than any other country, but it has a low ranking on almost every measure of health status (Papanicolas, Woskie, Orlander, Orav, & Jha, 2019). This apparent paradox can be largely explained by the fact that healthcare, while important, is a relatively poor predictor of long-term health. A far greater contributor to health outcomes is individual behavioral patterns, which account for almost 40% of deaths in the U.S. (Schroeder, 2007). Among the determinants of health, healthcare receives by far the most attention and resources from American citizens and politicians. The above data suggests, though, that it would likely be beneficial to focus more on preventing pathology by changing the behaviors that people choose to engage in (Thaler & Sunstein, 2009). If we want to successfully change people's behavior patterns, however, it is important to learn more about the mechanisms underlying them.

Prospect theory explains how people choose between different options under conditions of risk and uncertainty. It emerged as an alternative to expected utility theory (EUT) that better accounts for humans' cognitive limitations and arguably irrational decision-making (Dhami & al-Nowaihi, 2007). Two key concepts that Kahneman and Tversky (1979) formulated in their seminal paper on prospect theory are loss aversion and risk aversion. Loss aversion describes the propensity to prefer avoiding losses over obtaining equivalent gains, while risk aversion denotes the tendency to avoid options that entail a risk of loss when choosing between alternatives. For example, if someone would be more upset about losing five dollars than they would be happy about winning five dollars, they are demonstrating loss aversion. If someone chooses to have a 100% chance of losing five dollars over a 50% of losing ten dollars, they are acting risk averse.

Kahneman and Tversky (1979) found that people weigh losses, on average, about twice as heavily as gains, and subsequent research has generally shown similar results (Kahneman,

Knetsch, & Thaler, 1991). Many psychologists believe that there is an evolutionary basis for loss aversion. The asymmetry of people's reactions to pain versus pleasure, they say, makes sense in a world that punishes those who ignore danger signs more than it rewards those who pursue signs of pleasure, making loss aversion an adaptive trait (Newell, Lagnado, & Shanks, 2015). Recent studies suggest that even in the modern world, loss aversion may reduce the risks of engaging in unhealthy behaviors. Strickland, Beckmann, Rush, and Stoops (2017) found that cocaine users were less loss averse than non-users. Reduced loss aversion has also been shown in people with alcohol dependence (Brevers et al., 2014) and internet gaming disorder (Wang, Tian, Zheng, Li, & Lu, 2020). Loss aversion has been implicated in other well-documented effects, such as the endowment effect, which says that once people acquire something, they are reluctant to give it up, even if they are offered a price that is greater than they would have been willing to pay for the object initially. Status quo bias describes the common preference to remain in the same state rather than taking a risk and moving to another state. Some scholars have characterized this bias as a result of loss aversion; the disadvantages of leaving the status quo loom larger than the advantages (Kahneman et al., 1991). Loss aversion has also been used to account for disposition effects in finance, the equity premium puzzle, and framing effects (Walasek & Stewart, 2015). Proponents of loss aversion point to these effects as well as the potential evolutionary benefits of loss aversion as evidence of the phenomenon's existence.

Recently, though, some researchers have called into question whether most people are truly loss averse. In one experiment, people predicted that losses would be more impactful than gains. However, there was little difference observed when the outcomes were actually experienced (Kermer et al., 2006). The experimenters insisted that the supposed asymmetrical impact of losses versus gains is the result of affective forecasts rather than actual experiences,

and humans' affective forecasting is notoriously inaccurate (Newell et al., 2015). Mukherjee (2019) contended that psychologists' widespread acceptance of loss aversion's existence is due to publication bias, and Gal and Rucker (2018) claimed in a literature review that loss aversion is not required to explain the status quo bias. Gal (2006) and Ert and Erev (2013) suggested that the decision not to accept a lottery with an equal chance of losing and winning an equivalent amount should be interpreted as evidence of status quo bias and not as an indication of loss aversion. The authors based their observation on the finding that loss aversion is generally reduced when the decision to accept or reject a gamble is reframed as a choice between the gamble and zero. Gal and Rucker (2018) also asserted that the weight of the evidence does not support a general tendency for losses to loom larger than gains. They argued for a more contextualized perspective whereby losses sometimes loom larger than gains, but sometimes the reverse is true.

A primary reason that loss aversion has been subject to challenges is that recent research has emphasized the effects of context and experience on decision making. This includes studies showing that risk and loss aversion can change as a result of direct experience with losses and gains. Camilleri and Newell (2010), for instance, gave participants repeated choices between a risky option that paid out an unpredictable high or a low reward amount and a safe option that paid out a certain intermediate reward amount. After experience with 100 trials, participants became less likely to choose the risky option, suggesting that participants can change their risk attitudes based on experience.

An experiment by Walasek and Stewart (2015) demonstrated how experience with gains and losses can influence attitudes toward loss. They manipulated the ranges of gains and losses available in different experimental conditions and found that participants demonstrated loss aversion, loss neutrality, and even the reverse of loss aversion, depending on which condition

they experienced. They were able to accurately predict participants' attitudes toward loss using their decision by sampling model, which is based on the idea that people do not possess stable internal scales to represent subjective value or probability. According to the model, decision makers are sensitive to the rank of amounts within a set sampled from memory because they evaluate options by counting favorable binary comparisons within the sample (Walasek & Stewart, 2015). For example, people will act as though $25 has a subjective value of $^2/_5$ if the sample contains the amounts $10, $20, $30, $40, and $50 because $25 compares favorably in two of the five possible comparisons. If a sample is positively skewed, with more small amounts than large amounts, then the model predicts that a concave function will emerge from the process of sampling and binary comparison. As Walasek and Stewart (2015) anticipated, their participants demonstrated loss aversion only when the range of possible gains they were presented with was larger than the range of potential losses. When the range of possible losses was greater, people exhibited the reverse of loss aversion, and when possible gains and losses were symmetrical, people showed loss neutrality. These results led Walasek and Stewart (2015) to theorize that loss aversion arises from an asymmetric representation of gains and losses in people's memories, which occurs due to historical differences in the distributions of gains and losses they have experienced. Walasek and Stewart's (2019) study failed to replicate the reversal of loss aversion that they observed in 2015, but the authors were able to produce varying degrees of loss aversion through their manipulations of the ranges of gains and losses, so they concluded that rank effects were at least partially responsible for people's loss aversion, supporting their conclusion from 2015.

There is evidence that loss aversion can be used to change behavior. Patel et al. (2016) studied whether the way that an incentive for physical activity was framed affected how often

participants (overweight and obese adults) met their exercise goals. Participants were assigned to a no-reward control group or one of three financial incentive programs. Participants in the gain incentive group were given $1.40 for each day they met their fitness goals, those in the lottery incentive group had a random chance of receiving a reward with an average value of $1.40 when they met their goals, and members of the loss incentive group were paid $42 upfront and had to return $1.40 for each day that they failed to meet their goals. The study revealed that framing the reward as a loss resulted in significantly more days in which participants met their exercise goal than offering no reward, while framing a reward of the equivalent expected value as a lottery or a gain resulted in participants having no more fitness success than their counterparts in the control group. This finding demonstrates that loss aversion can make a significant impact on behavior, specifically in an exercise setting. It also implies that if there are major differences in the levels of loss aversion of specific populations or individuals, then the most effective methods of motivating people might have to be tailored to their particular attitudes toward loss.

Quotes from prominent figures in the world of elite sport demonstrate that athletes and coaches think of loss aversion as a key predictor of victory or defeat. Michael Jordan, for instance, once said, “When you hate losing more than you love winning, you take excuses off the table” (Pais, 2017). Other self-proclaimed loss-averse athletes include Serena Williams, Jackie Robinson, Lance Armstrong, Jimmy Connors, Larry Bird, and Billy Beane. Jeff Hornacek, who has coached for the NBA’s New York Knicks, Phoenix Suns, and Houston Rockets, explained why he tried to develop a loss-averse mindset in his players: “The mentality of a Kobe Bryant, a Michael Jordan, a LeBron James, I think they hate to lose more than they love to win…. When you love to win and you don’t [hate to lose], it’s like, ‘OK, well maybe we’ll win the next game.’ When you hate to lose and you lose a game, it eats after you the next game and then you go after

it. We've got to get that mentality now" (Manrique, 2018). Not all successful athletes feel the same way as Hornacek, however. The young tennis star Coco Gauff, for example, thinks her lack of loss aversion helps her avoid feeling too much pressure. She declared, "I just want to win more. I love winning more than I hate losing" (Millington, 2019). It is possible, of course, that any of these athletes' perceived levels of loss aversion do not align with their actual attitudes toward loss, but their interest in loss aversion suggests that future athletes and coaches may seek out and benefit from information about decision-making differences.

Previous studies contrasting risk and loss aversion in athletes versus non-athletes are limited and have had mixed results. Buccetti's (2012) study of MBA students suggested that former collegiate athletes were not significantly different from non-athletes in their likelihood of investing in risky (hypothetical) stocks or in their self-described risk aversion. Bleichrodt, L'Haridon, and Van Ass (2016) compared recreational and professional hockey players and found that, while the elite athletes were more optimistic, there were no significant differences between the two groups' levels of loss aversion, which was measured using a mixed-gambles task. Their results led them to theorize that "success in sports is not associated with attitudinal differences towards money outcomes or towards gains and losses" (Bleichrodt et al., 2016). However, Lazzaro (2013) found that collegiate athletes were more loss averse than non-athletes and that they were also more risk averse before incurring any gains or losses but equally risk averse after incurring gains. His results supported his hypothesis, which was that athletes would be more loss averse than non-athletes because they are conditioned to be loss-averse when competing. Conversely, studies of behavior outside the laboratory have shown a relative lack of risk aversion in athletes. For example, Nattiv, Puffer, and Green (1997) found that college athletes engaged in a significantly greater number of risky behaviors, such as gambling and

substance abuse, than their nonathlete peers. Another study with middle school students found the same trend among members of that age group (Garry & Morrissey, 2000).

A few studies have purported to reveal that professional athletes are loss averse while playing their respective sports, but in reality, some of these studies are not necessarily demonstrating loss aversion as defined by Kahneman and Tversky (1979). For example, Berger and Pope's (2011) analysis of more than 18,000 professional basketball games showed that teams who are losing by a point at halftime are more likely to win than those who are winning by a point at halftime. There are factors that could account for this trend even if the athletes do not value winning less than they detest losing, however. It is possible that teams who are losing at halftime are more likely to reevaluate their strategy because they realize that their current tactics have put them on track to lose. Berger and Pope (2011) attempted to rule out alternative explanations such as this one with a laboratory task in which participants competed in a button-pushing task. Participants pushed two computer keyboard buttons as quickly as possible, and halfway through the task, some were randomly assigned to be told that they were slightly behind their opponents, while others were told that they were slightly ahead. The researchers found that only the participants who were told they were losing increased their button-pressing speed in the second half of the task. Since there was no complex strategy involved in this task, the authors attributed this improvement to increased effort resulting from increased motivation to win for participants in the "loss" condition. However, it is possible that participants in the "win" condition failed to increase their effort not because they were any less motivated to win but because they understandably thought that their current effort was enough to secure the win that they were already on track to achieve.

Anbarci, Arin, Okten, and Zenker (2017) and Anbarci, Arin, Kuhlenkasper, and Zenker (2018) analyzed professional tennis players' serve speeds during a tournament in Dubai, and they found that male players served faster when they were behind in a game. They argued that this revealed that the players complied with prospect theory and exhibited loss aversion. However, Krawczyk (2019) noted multiple flaws with this conclusion, including the fact that increased serve speed does not necessarily mean the server is putting in more effort. A faster serve could result from the server putting less spin on the ball or having less muscle tension. Additionally, even if a fast serve does result from increased effort on the serve itself, a crucial benefit of serving faster is that it usually shortens a point, requiring less overall effort from the server following the serve. Krawczyk (2019) also pointed out that professional tennis players are expected to win the games that they serve, so the expected value of winning a point when the server is behind in the game is greater than the expected value of winning a point when the server is ahead. Therefore, a loss-neutral server should be expected to value a point more when he is behind than when he is ahead.

Unlike many other studies on loss aversion in sport, Pope and Schweitzer's (2011) study seems to show professional athletes acting loss averse during competition. Using precise laser measurements, the researchers analyzed more than 2.5 million putts by professional golfers in PGA Tour tournaments. The golfers were less likely to make putts when putting for birdies than when putting for par, and they were less likely to make putts when putting for par than when putting for bogeys. Pope and Schweitzer (2011) used par as a reference point, meaning that birdies were considered wins, and bogeys were considered losses. The accuracy disparity between types of putts remained even when controlling for overconfidence, nervousness, and shot difficulty. This suggests that the golfers' improved performance on bogey putts relative to

par putts and par putts compared to birdie putts resulted from increased focus and motivation when they were putting to avoid a loss as opposed to when they were trying to gain a win. Presumably, golfers' motivation to make certain putts is positively correlated with the hedonic value of making them, indicating that the golfers in this study did weigh losses more heavily than gains. Pope and Schweitzer (2011) supported this theory with anecdotal evidence as well, citing Tiger Woods as saying, "Any time you make big par putts, I think it's more important to make those than birdie putts….The psychological difference between dropping a shot and making a birdie, I just think it's bigger to make a par putt."

This thesis consists of two experiments. In the first experiment, I attempted to determine whether levels of loss aversion and risk aversion differ between athletes and non-athletes, using survey results from members of University of Vermont club sports teams and members of the school's non-athletic clubs. In the second, I explored whether it is possible to change individuals' levels of loss aversion by manipulating the range of gains and losses that they have experienced.

The participants in my first experiment completed the decision-making survey between March and September of 2021, when in-person learning at the University of Vermont was cancelled due to the Covid-19 pandemic. Club sports teams were not practicing during this time, suggesting that any decision-making disparities found between athletes and non-athletes can likely be attributed to long-term differences between the populations rather than acute effects of sport participation that might last for a few minutes, hours, or days following practices or competitions. However, it is possible that athletes and non-athletes' decision making might differ more when athletes are competing regularly, either due to acute increases in testosterone following exercise or competition or due to other mediating variables.

Each experiment in this thesis measured loss aversion with a 50-50 gamble task that arranged different hypothetical losses and gains across gambles. It is possible that the hypothetical nature of this task may have influence participants' decisions. However, other studies, such as that of Walasek and Stewart (2015), have used hypothetical financial decisions and have consistently found levels of loss aversion similar to the levels seen in non-hypothetical experiments (e.g., Tom, Fox, Trepel, & Poldrack, 2007). Therefore, the key cognitive processes likely occurred in approximately the same way that they would have if participants had been gambling for real money.

My first experiment used a propensity (self-reported preference) survey to measure risk aversion. This approach was based on research by Frey, Pedroni, Mata, Rieskamp, and Hertwig (2017), who found that a general factor of risk preference (R) exists and is reliable over time, indicating that it is likely a stable trait. This finding is consistent with other evidence, using large, representative samples in many countries, which has revealed significant correlations between risk attitudes measured in different contexts (Bleichrodt et al., 2016). Frey et al. (2017) also compared the reliabilities of different measures of risk preferences and found major differences. Specifically, behavioral measures (e.g., multiple price lists) were found to be the least reliable, and propensity (self-reported preference) measures were revealed to be more reliable. Propensity measures were highest in convergent validity as well (Frey et al., 2017). Consequently, I thought that a validated, commonly used propensity survey would be the best way to measure risk aversion.

Experiment 1

In Experiment 1, I attempted to examine whether athletes and non-athletes differed in various aspects of decision making. Members of University of Vermont club sports teams and

the school's non-athletic clubs completed surveys online. Participants completed a battery of decision-making tasks, including the Monetary Choice Questionnaire (Kirby, Petry, & Bickel, 1999), Probability Discounting Questionnaire (Madden, Petry, & Johnson, 2009), Domain-Specific Risk-Taking Scale (Blais & Weber, 2006), and a mixed-gambles task (Tom et al., 2007), to assess delay discounting, probability discounting, risk aversion, and loss aversion, respectively. These tasks were selected because they are validated, straightforward, widely used, and can be completed in a relatively short amount of time.

A better understanding of how athletes approach risk and loss could inform methods to help athletes succeed in sport and outside of it. For instance, this knowledge could provide insight into how to best motivate athletes and influence their performance under pressure, and it may help to explain why athletes have been shown to engage in more maladaptive, risky behaviors than their non-athlete counterparts.

Based on previous research showing that athletes engage in more risky behavior than non-athletes, athletes were expected to be less risk averse than non-athletes. Contrary to Bleichrodt et al. (2018) and Lazarro's (2013) conclusions, athletes were also expected to be less loss averse than non-athletes, either because their experience suffering from losses has desensitized them to the pain of losing or because less loss-averse people are more likely to enjoy and persist in athletic endeavors. Finally, delay discounting and probability discounting were included as control measures and expected to trend in the same direction as any differences in risk and loss aversion.

Method

Participants

Participants included University of Vermont club sport student-athletes (n = 49) and members of the school's non-athletic clubs (n = 43). Participants were recruited by emailing the officers of every registered club at UVM and asking them to forward the email to all of their clubs' members. A target sample size of 100 per group was based on online studies that used similar tasks (Walasek & Stewart, 2015). Recruitment took place from March 2020 to September 2020. Participants were incentivized to complete the questionnaire with the chance to enter a lottery in which 1 in 10 entrants was randomly selected to receive a $40 Amazon gift card. All procedures and materials were approved by the University of Vermont Institutional Review Board (UVM IRB; Protocol #18-0238).

Materials

Demographics Survey. This survey asked for participants' gender identity, age, nationality, and primary language spoken.

Delay Discounting. Delay discounting was measured using the 27-item Monetary Choice Questionnaire (MCQ) (Kirby, Petry, & Bickel, 1999). The MCQ is a validated, widely used measure of delay discounting tendencies (preferences for immediate versus delayed rewards). It asks participants to choose between taking hypothetical, immediate monetary rewards ($11-$80) or larger rewards ($25-$85) available after delays ranging from seven days to six months. On every item, participants chose one of two options: "smaller reward today" or "larger reward in the specified number of days."

Probability Discounting. Probability discounting was measured using the Probability Discounting Questionnaire (PDQ) (Madden, Petry, & Johnson, 2009). The PDQ is another validated, widely used measure, despite being developed ten years after the creation of the MCQ. It is composed of 30 items across three 10-question blocks and measures probability discounting,

which is the extent to which someone values probabilistic gains less than certain gains. Participants were asked to choose between accepting a hypothetical, guaranteed amount of money or a chance of winning a larger sum of money. In block 1, the choice was between $20 guaranteed or a [10-83%] chance of $80. In block 2, the choice was between $40 guaranteed or a [18-91%] chance of $100. In the third block, the choice was between $40 guaranteed or a [40-97%] chance of $60.

Risk Attitude. Risk attitude was measured using the 30-Item Domain-Specific Risk-Taking (DOSPERT) Scale (Blais & Weber, 2006), which assesses people's self-reported willingness to engage in various types of hypothetical risky behaviors across five domains of life (health/safety, social, recreational, financial, and ethical risks). Items were presented in a 7-point Likert format ranging from 1 (*Extremely Unlikely*) to 7 (*Extremely Likely*).

Loss Aversion. Loss aversion was measured using a mixed-gambles task (Tom et al., 2007), which is frequently used to study decision making under conditions of uncertainty. Participants were presented with hypothetical gambles in which they had a 50% chance of gaining a specified amount of money and a 50% chance of losing a different amount. On each trial, the participant decided whether to accept, strongly accept, reject, or strongly reject the gamble. The amounts of potential gains and losses varied across trials, and the average gain was twice as great as the average loss. Potential gains ranged from $12 to $40 in $4 increments, and potential losses ranged from $6 to $20 in $2 increments. Each possible combination of those eight losses and eight gains were presented in a random order. The original task consists of 256 trials, but this version arranged only 64 unique combinations of gain and loss (following Walasek & Stewart, 2015).

Dietary Questionnaire (Turconi et al., 2003). Participants completed slightly modified versions of sections C and D of Turconi et al.'s (2003) 8-section dietary questionnaire. Section C of the questionnaire asks 14 multiple-choice questions about food habits, and Section D asks 6 multiple-choice questions about physical activity and lifestyle. Modifications were made to some items in Section 6 to make the questionnaire more suitable for American participants (the original questionnaire was developed in Italy). For instance, a possible response to the question, "at breakfast you eat:" was changed from "pizza/focaccia/toast" to "pizza/flatbread/toast."

Procedure

Participants were sent a URL that they could click on, which would lead them to a website where they completed the above tasks in order. Following the completion of these questionnaires, participants were asked what type(s) of club they participated in (dance, club sports team, arts/performance, academic/career, or diversity/cultural/religious). They were also asked, "If you are on a club sports team, does your team participate in competitions against other schools?" Only participants who responded affirmatively to that question were categorized as athletes.

Data Analysis

The MCQ and PDQ, which measured delay discounting and probability discounting, are scored differently than most self-report measures. The questionnaires generate inferred hyperbolic temporal and probability discounting functions, respectively, by comparing choice preferences to arrays of functions to which the individual items are preconfigured. Gray et al. (2016) created R and SPSS syntax to facilitate the calculation of these indices. I used these to generate parameters representing the slope of the discounting curves from MCQ and PDQ responses. This parameter is referred to as k for delay discounting, where a greater k value

corresponds to steeper discounting. Probability discounting is indexed by a slope parameter, *h,* which corresponds to slope relating discounting of values as a function of uncertainty. The *k* and *h* values tend to skew toward small values, so they were natural log transformed prior to analysis (following Mellis, Snider, Deshpande, LaConte, & Bickel, 2019).

Risk attitudes were calculated by totaling the responses, ranging from 1 to 7, from each of the 30 items on the DOSPERT Scale. Possible risk-taking scores ranged from 30 to 210, with a higher score indicating less risk aversion.

Loss aversion was calculated by counting participants' proportions of accept responses—the total number of times they chose to "accept" or "strongly accept" gambles divided by 64. A higher proportion of accept responses indicated less loss aversion. Analysis of variance was used to compare athletes and non-athletes on the loss aversion, risk aversion, delay discounting, and probability measures. An alpha level of .05 was used for all statistical tests.

Results

The top of Figure 1 shows the results of a delay discounting test, and it may appear from the graph that the mean slope of the discounting curve (displayed as the natural log of the slope of the hyperbolic discounting function, *k*) was slightly closer to zero for athletes, which would indicate steeper discounting of delayed reward value. However, this difference was not statistically significant, $F(1, 71) = 1.49$, $MSE = 1.64$, $p = .226$, $\eta_p^2 = .021$. The bottom of Figure 1 shows the results of a probability discounting test, in which a higher natural log of *h* indicates a greater preference for smaller, certain rewards over larger, uncertain rewards. Athletes demonstrated a greater preference for certainty, but again, this difference was not significant, $F(1, 90) = 1.08$, $MSE = 0.77$, $p = .301$, $\eta^2_p = .012$.

The top of Figure 2 shows the results of the DOSPERT questionnaire measure of risk attitudes, in which a higher score indicates greater willingness to take risks. There was a significant difference between athletes (M = 111.06, SD = 17.76) and non-athletes (M = 102.73, SD = 15.88) in their levels of risk aversion, with athletes demonstrating less risk aversion, $F(1, 88) = 5.40$, $MSE = 1{,}548.73$, $p = .022$, $\eta^2_p = .058$.

The bottom of Figure 2 shows the results of a mixed-gambles task, which measures loss aversion. A greater proportion of accept decisions on the task indicates a lower level of loss aversion. Since the expected value of the "gain" options was two times greater than the expected value of the "loss" options, loss aversion would predict that participants would accept roughly half of the gambles. The non-athletes (M = 0.49, SD = .25) did almost exactly that, while the athletes accepted more gambles on average (M = 0.57, SD = 0.24), suggesting that they were less loss averse. However, again, the statistical test of this difference did not reach significance, $F(1, 92) = 2.84$, $MSE = 0.17$, $p = .095$, $\eta^2_p = .030$.

Discussion

Experiment 1 studied decision making in athletes and non-athletes using online survey and behavioral task measures. Overall, the results are consistent with the idea that athletes tend to be less risk averse, and, although not quite significantly, less loss averse than non-athletes. These results add to the literature on decision making and individual differences in athletes. Although these characteristics could be successfully measured with surveys, this approach does not allow me to differentiate a role for loss and risk experience in athletics in decision making. For instance, athletes might be willing to accept more risk due to their history of making risky decisions in competition. Experiment 2 was conducted to examine how experience might influence performance on the mixed gambles measure of loss aversion.

Experiment 2

Walasek and Stewart have recently shown that the ranges of losses and gains have a large influence on the extent to which the mixed-gambles task reveals loss aversion (Walasek & Stewart, 2015; Walasek & Stewart, 2019). However, these experiments limited their comparisons to between-subjects designs. Therefore, the present experiment examined performance in the mixed-gambles task across repeated measurements within subjects.

Two groups of undergraduates completed an in-person, socially distanced study. This experiment did not compare athletes and non-athletes. Participants completed the same mixed-gambles task that was used in Experiment 1, but unlike in the first experiment, they completed it three times. For one group (Group AAA), the ranges of gains and losses were the same as those in Experiment 1 for all three phases. For the second group (Group ABA), the ranges were reversed in the second phase. Based on Walasek and Stewart's (2015) results, loss aversion was expected to decrease in Phase 2 for the group with the flipped ranges of gains and losses, as evidenced by the rejection of most of the gambles. Participants in Group ABA were also expected to return to their original levels of loss aversion in Phase 3.

Method

Participants

University of Vermont ($N = 73$) students completed an online survey in a computer lab in Dewey Hall. Data collection took place from September 2020 to November 2020. A target sample size of 100 was based on prior studies that examined loss aversion with the same task (Walasek & Stewart, 2015). Participants did not receive any monetary compensation for their participation. They were recruited using an anonymous, online participant recruitment and management software called SONA Systems. Participating in the study allowed them to receive

course credit for various introductory-level psychology courses. All procedures and materials were approved by the UVM IRB under the same protocol used for Experiment 1.

Materials

Participants came into a computer lab and sat at a cubicle containing a computer with a 19-inch monitor, a keyboard, and a mouse. Participants completed a modified version of the mixed-gambles task used in Experiment 1, and then they completed the same delay discounting, dietary questionnaire, and demographics surveys used in Experiment 1.

Procedure

This experiment used a mixed design with a between-subject factor of Group (ABA, AAA) and a within-subject factor of Phase (1, 2, 3). Participants were randomly assigned to one of two groups: an experimental group ABA (n = 37) and a control group AAA (n = 36). Participants in both groups completed the same mixed-gambles task that was used in Experiment 1, but they completed it three times each, for a total of 192 trials. However, the second time Group ABA completed the task, they were given a slightly modified version in which the ranges of potential gains and losses were reversed, so that gains ranged from \$6 to \$20, and losses ranged from \$12 to \$40. After completing the mixed-gambles task, they also completed the same demographics survey and delay discounting survey used in Experiment 1.

Loss aversion was measured by counting the proportion of accept decisions (including both “accept” and “strongly accept”) made by participants. Loss aversion is inversely correlated with the proportion of accept decisions.

Loss aversion was also measured by fitting a logistic regression to each participants’ responses in order to calculate a loss aversion parameter λ (following Tom et al., 2007). The λ parameter represents the multiplicative weighting of the subjective value of losses relative to

gains. A λ of one demonstrates that gains and losses are equally valued, and loss aversion has disappeared. A λ of two reveals that losses are valued twice as much as equivalent gains. A λ below one shows that gains are being weighed more heavily than equivalent losses.

Results

The top of Figure 3 shows the proportion of accepted gambles across the three phases for groups ABA and AAA, and the bottom of figure 3 shows the two groups' levels of loss aversion according to the logistic regression method. During the first phase, each group accepted a similar number of gambles, and on average accepted the gamble on slightly more than half of the trials. In the second phase, Group ABA, which was exposed to reversed ranges of losses and gains, made significantly fewer accept decisions than Group AAA. In Phase 3, where both groups were once again exposed to equivalent ranges of losses and gains, group ABA accepted significantly more gambles than group AAA, although this disparity was not nearly as large as the opposite result in the previous phase. These observations were supported by a Group (ABA) by Phase (1, 2, 3) ANOVA, which found a significant effect of phase, $F(2, 142) = 12.65$, $MSE = 0.02$, $p < .001$, and a significant interaction, $F(2, 142) = 10.67$, $p < .001$. The main effect of group was not significant, $F < 1$. To understand the interaction, I compared the proportion of accept responses in each group in each phase. In Phase 1, each group accepted a similar number of gambles, $F < 1$. In Phase 2, Group ABA accepted significantly fewer gambles than group AAA, $F(1, 71) = 111.11$, $MSE = 3.46$, $p < .001$. In Phase 3, while this difference was not nearly as large as the difference found in Phase 2, group ABA accepted significantly more gambles than group AAA, $F(1, 71) = 4.27$, $MSE = 0.30$, $p = .042$.

In addition to comparing Group ABA's proportions of accept responses to those of Group AAA, I conducted one-sample t-tests to compare each groups' levels of loss aversion with the

levels predicted by prospect theory (Kahneman & Tversky, 1979). The theory predicts that for Group AAA, participants' proportion of accept decisions should be .5 in all three phases, and for Group ABA, participants' proportion of accept decisions should be .5 in Phases 1 and 3 but lower in Phase 2.

In Group ABA, participants' proportion of accept responses significantly differed from the proportion predicted by prospect theory in Phases 1 and 3. In Phase 1, the proportion of accept responses was greater than the proportion predicted by the model, $t(36) = 2.11$, $p = .042$, $d = .248$. In Phase 3, the proportion of accept responses was also greater than the proportion predicted by the model, $t(36) = 2.72$, $p = .010$, $d = .282$.

In Group AAA, participants' proportion of accept responses did not significantly differ from the proportion predicted by prospect theory in any of the three phases. In Phase 1, the proportion of accept responses was consistent with the model's prediction, $t(35) = 1.64$, $p = .110$. In Phase 2, the proportion of accept responses was consistent with the model's prediction, $t(35) = 0.200$, $p = .843$. In Phase 3, the proportion of accept responses was consistent with the model's prediction, $t(35) = -0.053$, $p = .958$.

Results of the logistic regression method revealed that the average λ was slightly greater than 2 for Group AAA participants in all three phases and for Group ABA participants in Phases 1 and 3, demonstrating loss aversion. In Phase 2, Group ABA participants' average λ was 0.961, demonstrating the disappearance of loss aversion.

Discussion

Participants faced with a larger range of gains relative to losses displayed loss aversion, while loss aversion disappeared for those who experienced a larger range of losses and reappeared when they faced a larger range of gains again. In Phase 3, Group ABA participants

accepted more gambles than Group AAA participants accepted in Phase 3. They also accepted more gambles than they had in Phase 1 when they had experienced the same ranges of gains and losses, seemingly demonstrating an incentive contrast effect (Flaherty, 1982). The results of Experiment 2 supported the Walasek and Stewart's (2015) decision by sampling theory. I believe that this was the first experiment to demonstrate that a laboratory intervention can be used to change loss aversion within subjects.

General Discussion

In Experiment 1, I compared athletes and non-athletes on four measures of decision making and found that the groups did not differ in their levels of delay discounting or probability discounting. Athletes were significantly less loss averse than non-athletes, and they were also less loss averse, although this difference was not significant. Experiment 2 showed that manipulating the ranges of gains and losses that participants are exposed to can make loss aversion disappear.

Experiment 1 found preliminary evidence for decision-making differences between athletes and non-athletes. Athletes were significantly less risk averse than non-athletes, and they were also less loss averse, although this difference did not quite reach significance. Future research should continue to explore disparities in decision making across populations, including in athletes, as well as in other populations (e.g., musicians, psychiatric populations, etc.). A better understanding of how athletes make decisions regarding potential risks or losses may help psychologists learn why athletes are so likely to have problems with gambling, substance abuse, STIs, etc. If psychologists, coaches, and others want to create environments that promote prosocial and healthy decision making and possibly prevent athletes from making dangerous decisions, they should know why athletes so frequently engage in risky behaviors. Increasing our

understanding of loss aversion in athletes may also provide insight into how to frame incentives to motivate them more effectively.

If there are differences between athletes and non-athletes' levels of risk aversion, hormonal differences may account for part of this disparity. Several studies have examined whether there is a link between testosterone and risk aversion. Apicella, Dreber, and Mollerstrom (2014) influenced men's testosterone levels by having them compete in a chance-based competition that was meant to temporarily boost the winner's testosterone. Men who experienced greater increases in bioactive testosterone took on more risk following the competition, even when controlling for whether they won. This result indicates that testosterone change can influence financial risk-taking decisions. Several other studies have also demonstrated a negative correlation between testosterone levels and risk aversion (e.g., Apicella et al., 2008; Stanton, Liening, & Schultheiss, 2011; Coates & Herbert, 2018), although Zethraeus et al.'s (2009) double-blind randomized study failed to find an effect of testosterone on risk aversion, and its authors attributed the profusion of conflicting findings to publication bias or the effects of other, unspecified biological factors. Testosterone's possible impact on risk aversion may explain, at least in part, why women have repeatedly been shown to be more risk averse than men (e.g., Sapienza, Zingales, & Maestripieri, 2009; Byrnes, Miller, & Schafer, 1999) and why acute exercise has been shown to increase sex differences in amateur athletes' risk-taking, making males more risk-seeking and females more risk-averse (Pighin et al., 2015). Sönksen et al. (2018) found that elite athletes in some sports tend to have higher testosterone levels than non-athletes, although this evidence is preliminary. If athletes do in fact have greater-than-average testosterone levels, it is possible that testosterone might mediate the relationship

between participation in sport and risk aversion. I did not measure participants' testosterone levels, so I do not know whether or how testosterone influenced my results.

This study had several limitations. Sample sizes were relatively small, and my samples largely lacked racial, ethnic, gender, and age diversity, which may limit the generalizability of my findings. It would also have been beneficial if I had been able to measure risk aversion in multiple ways (for example, with a propensity measure, a behavioral measure, and a frequency measure in which I would assess frequency of engagement in actual risky activities). Another limitation is that I was unable to study decision-making in varsity athletes, and I suspect that there may be more significant decision-making differences between varsity athletes and non-athletes than there are between club sport athletes and non-athletes. Furthermore, I did not compare decision-making differences between athletes from different sports or types of sports (e.g., contact sports versus non-contact sports), and I could not determine whether my results would have been different had the athletes taken the surveys during their respective sports' competition seasons. Some strengths of this thesis are that I used validated, well-established measures of decision making and that I was able to control for whether sports were in-season or not (because the Covid-19 pandemic caused all teams' seasons to be cancelled). I was also able to recruit athletes from a wide variety of sports, including cheerleading, running, equestrian, alpine ski racing, Nordic skiing, cycling, soccer, roller hockey, softball, basketball, Irish dance, timber sports, volleyball, shooting sports, quidditch, field hockey, squash, swimming, ultimate frisbee, and tennis.

For both experiments, I initially measured loss aversion by fitting a logistic regression to each participants' responses in order to calculate a loss aversion parameter λ (following Tom et al., 2007). The λ parameter represents the multiplicative weighting of the subjective value of

losses relative to gains. If λ is equal to one, then gains and losses are equally valued. If someone weighs losses twice as heavily as gains, as research suggests people often do, then λ is equal to two. If λ is below one, gains are being weighed more heavily than losses, and the reverse of loss aversion is being shown.

A recent study advised caution when calculating λ to measure individual differences from mixed-gamble data. Walasek and Stewart (2021) conducted a parameter-recoverability experiment, in which they simulated a mixed-gambles task and found that retesting the same participant repeatedly yields different estimates of loss aversion when using the logistic regression method. They argued that a more reliable way to test for individual differences in loss aversion is to simply count the number of accept decisions participants make, with a higher proportion of accept decisions indicating a lower level of loss aversion. Based on Walasek and Stewart's (2021) paper, I recalculated loss aversion using this procedure.

In Experiment 1, athletes were not significantly more or less loss averse than non-athletes regardless of how I calculated loss aversion. Similarly, Experiment 2 yielded consistent results for the logistic regression method and the accept decisions method. The congruence between my calculations using logistic regression and the results of my accept-decision analysis gives me confidence that my chosen methods of measurement accurately assessed participants' levels of loss aversion.

The results of Experiment 2 constrain theories of loss aversion to account for sensitivity to choice-by-choice differences in expected value. However, as of now, there is still no model that explicitly integrates the influences of context or experience with the gain/loss asymmetries that explain loss aversion. Researchers should continue to study how to most effectively measure loss aversion in different contexts and with different ranges of potential gains and losses. They

should also explore whether it is possible to manipulate different components of decision making and whether loss aversion accounts for unique aspects of decision making related to health.

Overall, this thesis extended the analysis of decision-making bias in several ways. Experiment 1 used an online task to compare athletes and non-athletes under similar conditions made possible by the current global pandemic. While the conclusions are preliminary, they identify areas for future study. Experiment 2 was the first to experimentally manipulate variables suggested to influence loss aversion within subjects. This method identified a strong and reliable sensitivity to potential gains and losses and has potential for application to the study of loss aversion in other areas related to health. Various measures of decision making have been shown to impact specific measures of health. Steep delay discounting, for example, is known to predict severity of substance use disorder and obesity. While there is some evidence of a relationship between loss aversion and health, there have been few studies of how or whether less loss aversion independently contributes to poor health outcomes. This thesis provides a basis for these future investigations.

References

Anbarci, N., Arin, K. P., Kuhlenkasper, T., & Zenker, C. (2018). Revisiting loss aversion: Evidence from professional tennis. *Journal of Economic Behavior and Organization*, *143*, 1-18. doi: 10.1016/j.jebo.2017.10.014

Anbarci, N., Arin, K. P., Okten, C., & Zenker, C. (2016). Is Roger Federer more loss averse than Serena Williams? *Applied Economics, 49*(35), 3546-3559. doi: 10.1080/00036846.2016.1262527

Apicella, C. L., Dreber, A., Campbell, B., Gray, P. B., Hoffman, M., & Little, A. C. (2008). Testosterone and financial risk preferences. *Evolution and Human Behavior*, *29*(6), 384-390. doi: 10.1016/j.evolhumbehav.2008.07.001

Apicella, C. L., Dreber, A., & Mollerstrom, J. (2014). Salivary testosterone change following monetary wins and losses predicts future financial risk-taking. *Psychoneuroendocrinology, 39*(1), 58-64. doi: 10.1016/j.psyneuen.2013.09.025

Berger, J., & Pope, D. (2011). Can losing lead to winning? *Management Science*, *57*(5), 817-827. doi: 10.1287/mnsc.1110.1328

Blais, A., & Weber, E. U. (2006). A Domain-specific risk-taking (DOSPERT) scale for adult populations. *Judgment and Decision Making, 1*(1), 33–47. 10.1037/t13084-000

Bleichrodt, H., L'Haridon, O., & Van Ass, D. (2016). The risk attitudes of professional athletes: Optimism and success are related. *Decision, 5*(2), 95-118. doi: 10.1037/dec0000067

Brevers, D., Bechara, A., Cleeremans, A., Kornreich, C., Verbanck, P., & Noël, X. (2014). Impaired decision-making under risk in individuals with alcohol dependence. *Alcoholism: Clinical & Experimental Research*, *38*(7), 1924-1931. doi: 10.1111/acer.12447

Buccetti, T. (2012). Risk aversion and former collegiate athletes as financial investor (unpublished thesis). Boston, MA. https://scholarworks.umb.edu/management_hontheses/1

Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin, 125*(3), 367–383. doi: 10.1037/0033-2909.125.3.367

Camilleri, A. R., & Newell, B. R. (2010). When and why rare events are underweighted: A direct comparison of the sampling, partial feedback, full feedback and description choice paradigms. *Psychonomic Bulletin & Review*, *18*(2), 377-384. doi: 10.3758/s13423-010-0040-2

Coates, J. M., & Herbert, J. (2018). Endogenous steroids and financial risk-taking on a London trading floor. *Proceedings of the National Academy of Sciencees*, *105*(16), 6167-6172. doi: 10.1073/pnas.0704025105

Dhami, S., & al-Nowaihi, A. (2007). Why do people pay taxes? Prospect theory versus expected utility theory. *Journal of Economic Behavior & Organization*, *64*(1), 171-192. doi: 10.1016/j.jebo.2006.08.006

Ert, E., & Erev, I. (2013). On the descriptive value of loss aversion in decisions under risk: Six clarifications. *Judgment and Decision Making*, *8*(3), 214-235. doi: 10.2139/ssrn.1012022

Flaherty, C. F. (1982). Incentive contrast: A review of behavioral changes following shifts in reward. *Animal Learning and Behavior*, *10*, 409-440. doi: 10.3758/BF03212282

Frey, R., Pedroni, A., Mata, R., Rieskamp, J., & Hertwig, R. (2017). Risk preference shares the psychometric structure of major psychological traits. *Science Advances, 3*(10), 1-13. doi: 10.1126/sciadv.1701381

Gal, D. (2006). A psychological law of inertia and the illusion of loss aversion. *Judgment and*

Decision Making, *1*(1), 23-32. https://ssrn.com/abstract=831104

Gal, D., & Rucker, D. D. (2018). The loss of loss aversion: will it loom larger than its gain? *Journal of Consumer Psychology*, *28*(3), 497-516. doi: 10.1002/jcpy.1047

Garry, J. P., & Morrissey, S. L. (2000). Team sports participation and risk-taking behaviors among a biracial middle school population. *Clinical Journal of Sport Medicine, 10*(3), 185-190. doi: 10.1097/00042752-200007000-00006

Gray, J. C., Amlung, M. T., Palmer, A. A., & MacKillop, J. (2016). Syntax for calculation of discounting indices from the monetary choice questionnaire and probability discounting questionnaire. *Journal of the Experimental Analysis of Behavior*, *106*(2), 156-163. doi: 10.1002/jeab.221

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *Journal of Economic Perspectives*, *5*(1), 193-206. doi: 10.1257/jep.5.1.193

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263-291. doi: 10.2307/1914185

Kermer, D. A., Driver-Linn, E., Wilson, T. D., & Gilbert, D. T. (2006). Loss aversion is an affective forecasting error. *Psychological Science*, *17*(8), 649-653. doi: 10.1111/j.1467-9280.2006.01760.x

Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology: General, 128*(1), 78–87. doi: 10.1037/0096-3445.128.1.78

Krawczyk, M. (2019). Unforced errors: Tennis serve data tells us little about loss aversion. *Econ Journal Watch, 16*(1), 114-123.

https://econjwatch.org/File+download/1102/KrawczykMar2019.pdf?mimetype=pdf

Lazzaro, S. (2013) The losing side of an athlete (unpublished thesis). Haverford, PA. https://pdfs.semanticscholar.org/ab4b/77938d1620740a397abc45f8df210f2a90b3.pdf

Madden, G. J., Petry, N. M., & Johnson, P. S. (2009). Pathological gamblers discount probabilistic rewards less steeply than matched controls. *Experimental and Clinical Psychopharmacology*, *17*(5), 283-290. doi: 10.1037/a0016806

Manrique, B. (2018, March 19). Jeff Hornacek explains meaning behind hating to lose more than loving to win. *ClutchPoints*. https://clutchpoints.com/knicks-news-jeff-hornacek-explains-meaning-behind-hating-to-lose-more-than-loving-to-win/

Millington, A. (2019, Aug. 22). Coco Gauff's father says he doesn't think his 15-year-old tennis star daughter is a 'prodigy.' *Business Insider*. https://www.businessinsider.com/coco-gauff-father-doesnt-think-daughter-is-a-prodigy-2019-8

Mellis, A. M., Snider, S. E., Deshpande, H. U., LaConte, S. M., & Bickel, W. K. (2019). Practicing prospection promotes patience: Repeated episodic future thinking cumulatively reduces delay discounting. *Drug and Alcohol Dependence*, *204*. doi: 10.1016/j.drugalcdep.2019.06.010

Mukherjee, S. (2019). Revise the belief in loss aversion. *Frontiers in Psychology*, *10*, 2723. doi: 10.3389/fpsyg.2019.02723

Nattiv, A., Puffer, J. C., & Green., G. A. (1997). Lifestyles and health risks of collegiate athletes: a multi-center study. *Clinical Journal of Sport Medicine, 7*(4), 262-272. doi: 10.1097/00042752-199710000-00004

Newell, B. R., Lagnado, D. A., & Shanks, D. R. (2015). *Straight Choices: The Psychology of Decision Making* (2nd ed.). Psychology Press. doi: 10.4324/9781315727080

Pais, M. (2017, March 15). How losing motivated Michael Jordan toward success. *The MDRT Blog*. https://www.imdrt.org/blog/how-losing-motivated-michael-jordan-toward-success/

Papanicolas, I., Woskie, L. R., Orlander, D., Orav, E. J., & Jha, A. K. (2019). The relationship between health spending and social spending in high-income countries: How does the US compare? *Health Affairs*, *38*(9), 1-9. doi: 10.1377/hlthaff.2018.05187

Patel, M. S., Asch, D. A., Rosin, R., Small, D. S., Bellamy, S. L., Heuer, J., … & Volpp, K. G. (2016). Framing financial incentives to increase physical activity among overweight and obese adults: A randomized, controlled trial. *Annals of Internal Medicine, 164*(6), 385-94. doi: 10.7326/M15-1635

Pighin, S., Savadori, L., Bonini, N., Andreozzi, L., Savoldelli, A., & Schena, F. (2015). Acute exercise increases sex differences in amateur athletes' risk taking. *International Journal of Sports Medicine*, *36*(10), 858-863. doi: 10.1055/s-0034-1398677

Pope, D. G., & Schweitzer, M. E. (2011). Is Tiger Woods loss averse? Persistent bias in the face of experience, competition, and high stakes. *American Economic Review*, *101*(1), 129-157. doi: 10.1257/aer.101.1.129

Sapienza, P., Zingales, L., & Maestripieri, D. (2009). Gender differences in financial risk aversion and career choices are affected by testosterone. *Proceedings of the National Academy of Sciences of the United States of America*, *106*(36), 15268-15273. doi: 10.1073/pnas.0907352106

Schroeder, S. A. (2007). We can do better—improving the health of the American people. *The New England Journal of Medicine, 357*(12), 1221-1228. doi: 10.1056/NEJMsa073350

Sönksen, P. H., Holt, R., Böhning, W., Guha, N., Cowan, D. A., Bartlett, C., & Böhning, D. (2018). Why do endocrine profiles in elite athletes differ between sports? *Clinical*

diabetes and endocrinology, *4*, 3. doi: 10.1186/s40842-017-0050-3

Stanton, S. J., Liening, S. H., & Schultheiss, O. C. (2011). Testosterone is positively associated with risk taking in the Iowa gambling task. *Hormones and Behavior*, *59*(2), 252-256. doi: 10.1016/j.yhbeh.2010.12.003

Strickland, J. C., Beckmann, J. S., Rush, C. R., & Stoops, W. W. (2017). A pilot study of loss aversion for drug and non-drug commodities in cocaine users. *Drug and Alcohol Dependence*, *180*, 223-226. doi: 10.1016/j.drugalcdep.2017.08.020

Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: improving decisions about health, wealth, and happiness.* Rev. and expanded ed. New York: Penguin Books.

Tom, S. M., Fox, C. R., Trepel, C., & Poldrack, R. A. (2007). The neural basis of loss aversion in decision-making under risk. *Science*, *315*(5811), 515-518. doi: 10.1126/science.1134239

Turconi, G., Celsa, M., Rezzani, C., Biino, G., Sartirana, M. A., & Roggi, C. (2003). Reliability of a dietary questionnaire on food habits, eating behavior and nutritional knowledge of adolescents. *European Journal of Clinical Nutrition*, *57*(6), 753-763. doi: 10.1038/sj.ejcn.1601607

Walasek, L., & Stewart, N. (2015). How to make loss aversion disappear and reverse: Tests of the decision by sampling origin of loss aversion. *Journal of Experimental Psychology: General, 144*(1), 7-11. doi: 10.1037/xge0000039

Walasek, L., & Stewart, N. (2019). Context-dependent sensitivity to losses: Range and skew manipulations. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 45*(6), 957-968. doi: 10.1037/xlm0000629

Walasek, L., & Stewart, N. (2021). You cannot accurately estimate an individual's loss aversion using an accept–reject task. *Decision, 8*(1), 2-15. doi: 10.1037/dec0000141

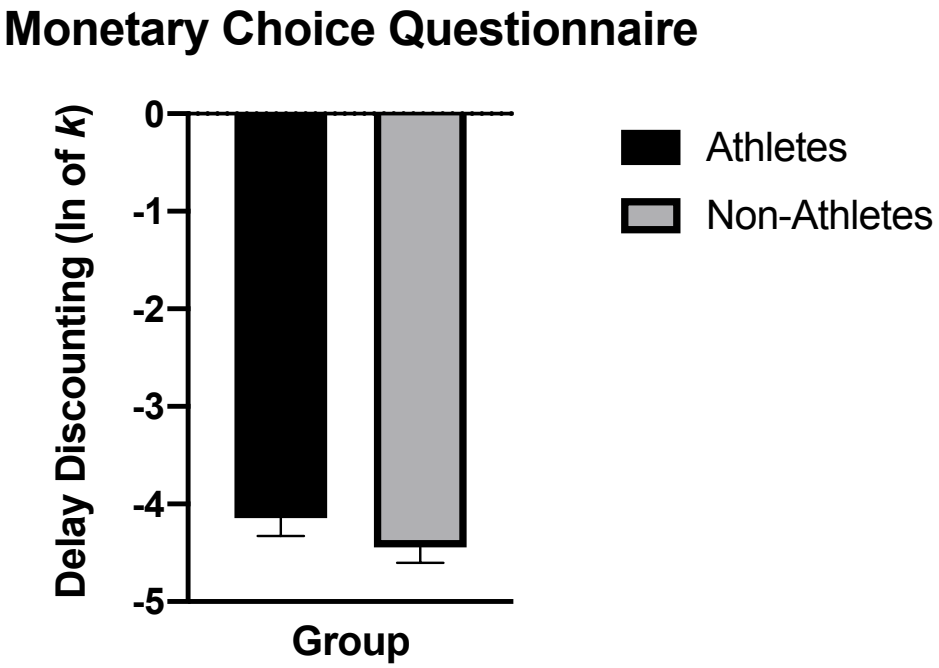
Wang, L., Tian, M., Zheng, Y., Li, Q., & Lu, X. (2020). Reduced loss aversion and inhibitory control in adolescents with internet gaming disorder. *Psychology of Addictive Behaviors*, *34*(3), 484-496. doi: 10.1037/adb0000549

Zethraeus, N., Kocoska-Maras, L., Ellingsen, T., Schoultz, B., Hirschberg, A., & Johannesson, M. (2009). A randomized trial of the effect of estrogen and testosterone on economic behavior. *Proceedings of the National Academy of Sciences of the United States of America*, *106*(16), 6535-6538. doi: 10.1073/pnas.0812757106

Demographics

EXPERIMENT 1	Athletes	Non-Athletes	Total
Males	**12**	**13**	**25**
Females	**34**	**29**	**63**
Other/NA	**3**	**1**	**4**
Total	**49**	**43**	**n=92**
EXPERIMENT 2	**Group ABA**	**Group AAA**	**Total**
Males	**9**	**6**	**15**
Females	**28**	**28**	**56**
Other/NA	**0**	**2**	**2**
Total	**37**	**36**	**n=73**

Figure 1


Monetary Choice Questionnaire
Delay Discounting (ln of k)
0
-1
-2
-3
-4
-5
Group
Athletes
Non-Athletes

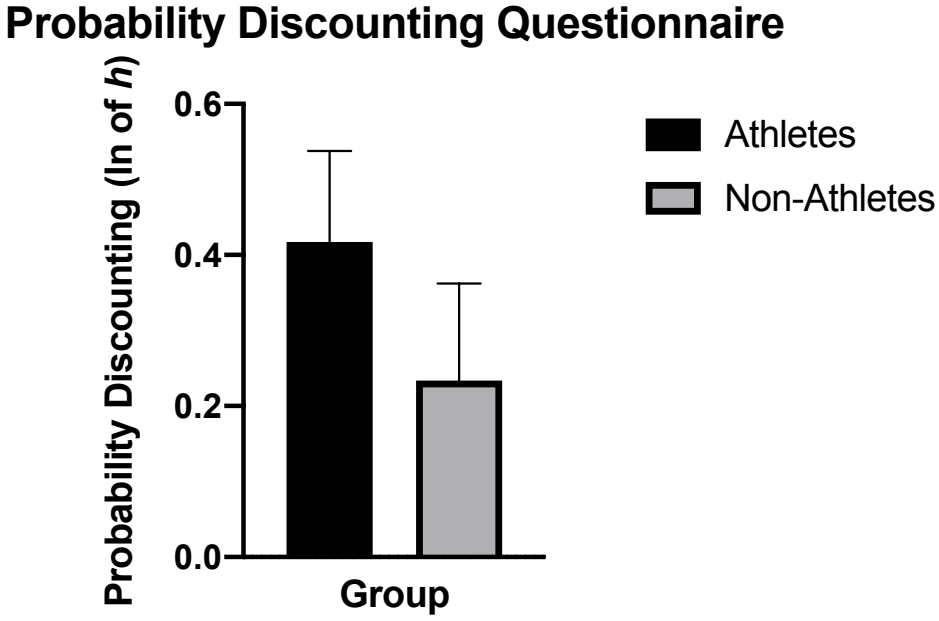
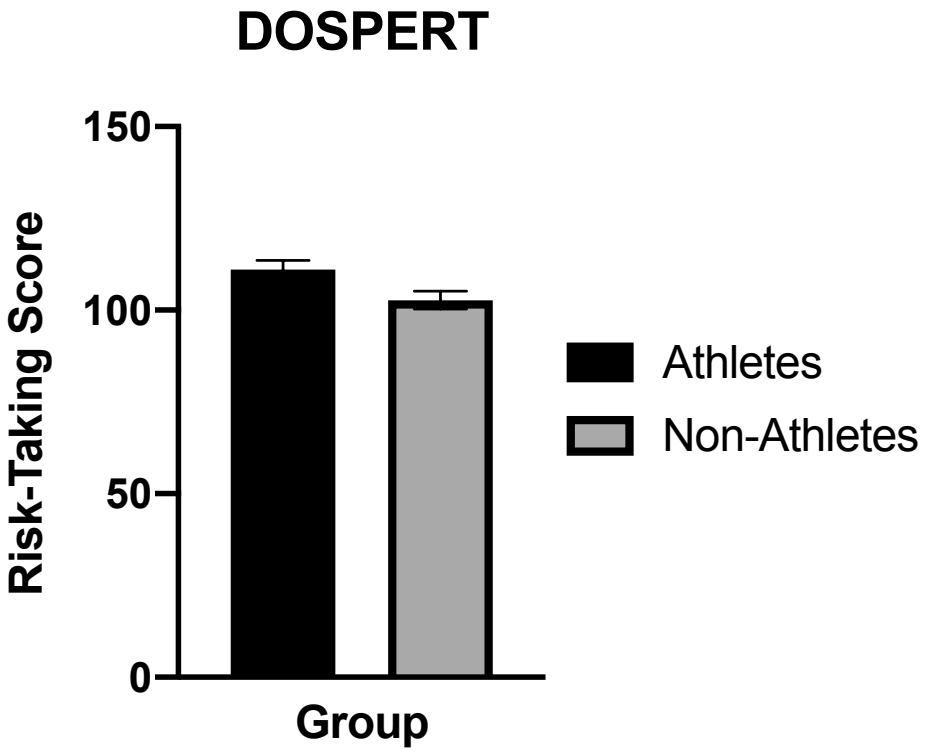

Probability Discounting Questionnaire
Probability Discounting (ln of h)
0.6
0.4
0.2
0.0
Group
Athletes
Non-Athletes

Figure 2


DOSPERT
Risk-Taking Score
150
100
50
0
Group
Athletes
Non-Athletes

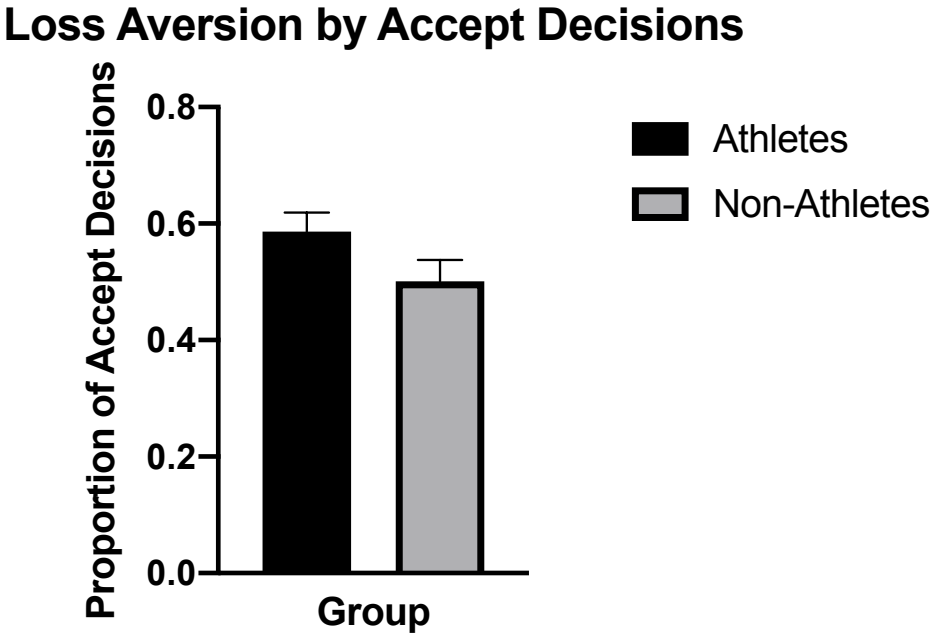
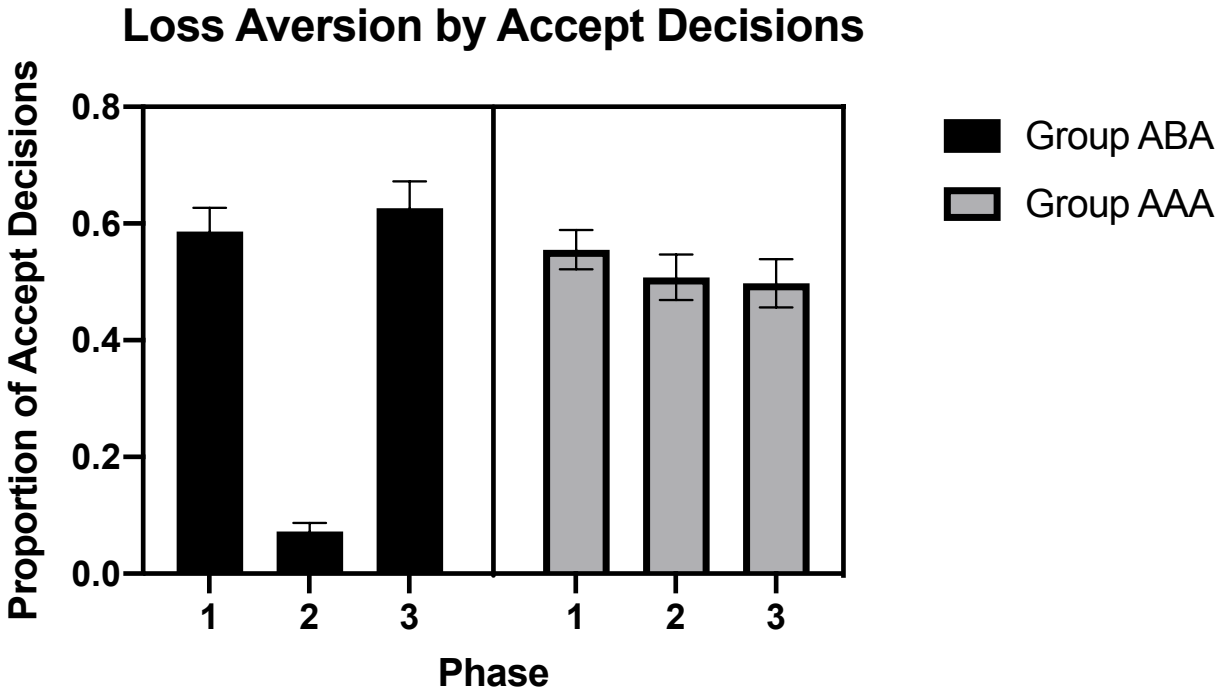
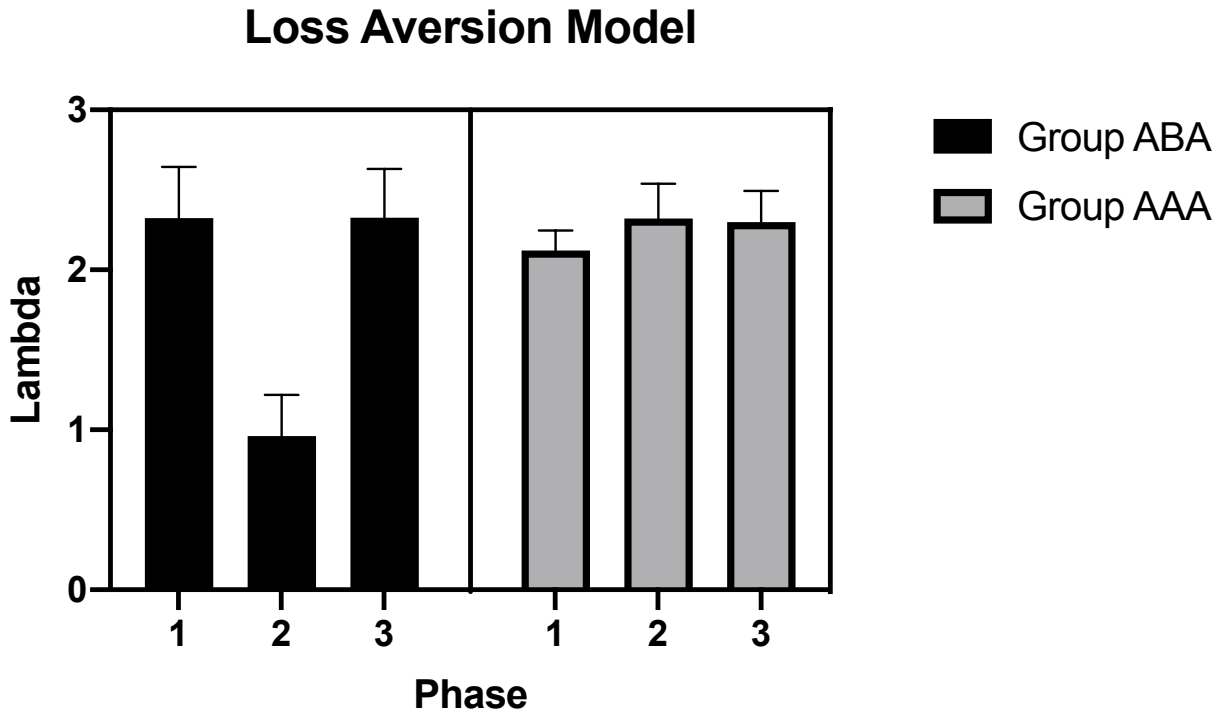

Loss Aversion by Accept Decisions
Proportion of Accept Decisions
0.8
0.6
0.4
0.2
0.0
Group
Athletes
Non-Athletes

Figure 3


Loss Aversion by Accept Decisions
Proportion of Accept Decisions
0.8
0.6
0.4
0.2
0.0
1
2
3
1
2
3
Phase
Group ABA
Group AAA


Loss Aversion Model
Lambda
3
2
1
0
1
2
3
1
2
3
Phase
Group ABA
Group AAA

Appendix 1

Recruitment Email to Club/Team Presidents

Dear [Club/Team President's Name],
My name is Julian Kafka, and I am conducting a research study for my thesis. The goal of the project is to understand whether, and to what degree, the activities individuals engage in are related to how they make decisions. I would be very grateful if you could forward the following email to the members of your club. In order to participate in the study, participants must be between the ages of 18 and 55, able to independently read and comprehend written materials, and able to provide informed consent. If you have any questions about this project, please contact me or the study director, Eric Thrailkill (Eric.Thrailkill@uvm.edu) at the University of Vermont. Thank you!

Dear [Club/Team Name] members,
You are invited to participate in a research project being conducted at the University of Vermont regarding decision making. The primary purpose of this study is to investigate the participation in club activities and decision-making attitudes. We aim to understand whether, and to what degree, the activities individuals engage in are related to how they decide to take chances or not. This project will provide implications for understanding how our daily lives influence how we make choices for the purpose of understanding how environments and experiences can facilitate choices and improve peoples' lives. In order to participate in the study, you must be between the ages of 18 and 55, able to independently read and comprehend written materials, and able to provide informed consent.

If you agree to participate, we would like you to complete an online survey (found below). You are free to stop taking this survey if you prefer not to answer any question. It will take approximately **45 to 60 minutes**. Confidential research data will be kept anonymous and secure (encrypted and stored in a locked file) for up to **10** years and will then be deleted. After completing the survey, you will have the option to enter a drawing for an **$40 Amazon.com gift card** in which 1 out of every 10 entries wins the gift card.
If you have any questions about this project, please contact Eric Thrailkill (Eric.Thrailkill@uvm.edu) at the University of Vermont.
Follow this link to the Survey: https://eathrail.w3.uvm.edu/index.html

Experiment 1 Written Instructions

Thanks for agreeing to participate in the study. **"Decision-making attitudes"** is a short psychological study investigating how people make decisions. It involves the following steps:

1. We ask for demographic information.
2. Because this is a University research project, we ask for your informed consent. (The format of the consent form is a standard university document).
3. The study then explains how to do the task in detail. You will need to pass a short test to check that you understand how the study works.
4. Next comes the experiment itself.
5. At the end, you will enter your email address to be entered into a drawing with a 1 in 10 chance to receive a $40 Amazon gift card.

The total time taken should be about 45 minutes. Please do not use the "back" button on your browser or close the window until you reach the end and enter your email address. This is very likely to break the experiment and may make it difficult for you to get a chance at the $40 gift card.

It is also important that you complete the task in **one** sitting on a **computer**. If you attempt to complete the experiment on another device (e.g. iPad, phone), then you may not be able to complete the experiment.

However, if something does go wrong, please contact us! When you are ready to begin, click on the "start" button below.

WELCOME TO THE EXPERIMENT!

Throughout the experiment, please read all instructions **carefully.**

If anything goes wrong during the experiment, please take a screenshot and notify the experimenter. Do **not** press the BACK button or quit out of the program.

If you complete the task, you will be entered in the $40 gift card drawing no matter what. Please take your time and think about your choices seriously.

Please do **not** write anything down. It will interfere with the results and will slow you down.

Experiment 1 Research Information Sheet

Participant Selection and Purpose of Study

You are invited to participate in a study of decision-making attitudes. You were selected as a possible participant in this study because we contacted your club advisor. In order to participate in the study, you must be between the ages of 18 and 55, able to independently read and comprehend written materials, and able to provide informed consent. This study is being conducted by Eric A. Thrailkill, Ph.D. at the University of Vermont, and all study procedures will take place remotely online using your internet browser.

Description of Study and Risks

Purpose: We hope to learn about how, and to what degree, the activities individuals engage in are related to how they make choices. Study Procedures: If you decide to participate, we will present you with some questionnaires and tasks that measure your attitude toward taking risks. Detailed instructions will be provided for the tasks before you begin. The exact number of questions you need to answer depends on which version of the task the computer assigns you to, but the on-screen display will inform you of how much further you have to go. The task should take approximately 45 minutes to complete including reading time. No discomforts or inconveniences besides some boredom are reasonably expected. No risks are reasonably expected as a result of your participation in this study. We cannot and do not guarantee or promise that you will receive any benefits from this study. These answers will be stored electronically.

No discomforts or inconveniences besides some boredom are reasonably expected. No risks are reasonably expected as a result of your participation in this study. We cannot and do not guarantee or promise that you will receive any benefits from this study.

Confidentiality and Disclosure of Information

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or except as required by law. If you give us your permission by clicking on the "I agree" button below, we plan to publish the results in academic journals and discuss the results at scientific conferences. In any publication, information will be provided in such a way that you cannot be identified.

Your consent

Your participation is voluntary, and you may refuse to participate without penalty or discrimination at any time.

Questions

If you have any questions or concerns following your participation, Research Assistant Professor Eric Thrailkill (802 656-1976, email. eric.thrailkill@uvm.edu) will be happy to address them. Complaints about the study may be directed to UVM's Research Ethics and Compliance Support, (phone. 877 310-0413, website. www.uvm.edu/rp/human-subjects-research).

Please keep a copy of this information sheet (you can download the pdf here)

PARTICIPANT CONSENT

By continuing, you are making a decision whether or not to participate. Clicking the button below indicates that, having read the information provided on the participant information sheet, you have decided to participate.

To withdraw your consent, simply close the browser tab. Your data will be deleted from our records.

Experiment 1 Demographics Questionnaire

Demographic information:
We need this information for our records, but it is kept completely separate from your email address. As long as you finish the experiment you will get a chance to enter the 1 in 10 drawing for the $40 gift card, so please be honest.

Ethnicity: Hispanic or Latino NOT Hispanic or Latino Unknown / Not Reported

Race: American Indian / Alaska Native Asian Native Hawaiian or Other Pacific Islander Black or African American White More than One Race Unknown / Not Reported

Gender: Male Female Transgender Male Transgender Female Gender Variant / Non-Conforming Not Listed

Prefer Not to Answer

Age:

Native Language(s):

Country you live in:

Experiment 2 Written Instructions

SONA Instructions

Study participation will take a total of approximately 30 minutes. The study consists of a computer task consisting of a series of choices to reject a 50/50 coin toss. Once the task is finished, you will have the opportunity to respond to a brief questionnaire that will provide us will your general thoughts about the study.

The study is located in John Dewey Hall Rm. 128 (Computer laboratory). The room allows for 6 individuals at a time to complete the study. Sanitization guidelines are being followed. All equipment is disinfected between participants. Masks and hand sanitizer will be available. Please do not arrive until your scheduled timeslot to avoid waiting in the hallways.
If you have any questions, please email the study director (Dr. Eric Thrailkill).

Laboratory Instructions

1) Log on the computer
2) Open Chrome
3) Go to https://redcap.med.uvm.edu/surveys
4) Enter LN4PCCY9A (not case sensitive)
5) Read the research information page

Experiment 2 Verbal Instructions

WELCOME TO THE EXPERIMENT!

Throughout the experiment, please read all instructions carefully. Please take your time and think about your choices seriously. Please do not write anything down. It will interfere with the results and will slow you down.

In this experiment, you will see a series of screens where you will be asked to choose whether or not you would accept a hypothetical gamble. Please answer by pressing "Accept" or "Strongly Accept" if you would take the gamble, and "Reject" or "Strongly Reject" if you would not. All gambles are 50/50 shots; that is, there is a 50% chance of winning the positive amount and a 50% chance of losing the negative amount.

We don't expect you to choose in any particular way, so please don't choose what you think we might want you to choose, but click on the choice you really would prefer given the option in real life. After each choice, the program will go on to the next screen, and it will tell you when you are done.

Experiment 2 Research Information Sheet

Research Information Sheet
Title of Study: Individual Differences in Decision Making (Project 3: Coin Flips 1)
Principal Investigator (PI): Eric A. Thrailkill, Ph.D. Research Assistant Professor Department of Psychological Science, University of Vermont
Sponsor/Funder: Department of Psychological Science, University of Vermont National Institutes of Health

Introduction
You are invited to participate in a study of how people, in general, form links between events. You were selected as a possible participant in this study because you accepted our study invitation. In order to participate in the study, you must be between the ages of 18 and 55, able to independently read and comprehend written materials, and to provide informed consent. This study is being conducted by Eric A. Thrailkill, Ph.D. at the University of Vermont and all study procedures will take place during this visit.

Purpose
The study is concerned with the question of how people, in general, form links between events. It should be emphasized that the experiment is not a test of your personal abilities or skills.
Study Procedures
If you decide to participate, we will present you with questionnaires that ask about what you would do in a series of hypothetical situations, and some questionnaires about your preferences. Detailed instructions will be provided for the tasks before you begin.
The task should take approximately 30-40 minutes to complete including reading time. No discomforts or inconveniences besides some boredom are reasonably expected. No risks are reasonably expected as a result of your participation in this study. We cannot and do not guarantee or promise that you will receive any benefits from this study.
The answers will be stored electronically. Once the task is finished, you will have the opportunity to respond to a brief questionnaire that will provide us with your general thoughts about the study.

Benefits
As a participant in this research study, there may not be any direct benefit for you; however, information from this study may benefit other people now or in the future.

Risks
We will do our best to protect the information we collect from you during this study. We will not collect any information that will identify you to further protect your confidentiality and avoid any potential risk for an accidental breach of confidentiality. Your participation in this study does not involve any physical or emotional discomfort to you beyond that of everyday life.

Costs
There will be no costs to you for participation in this research study. Compensation Course credit will be assigned on Sona.

Confidentiality

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or except as required by law.
If you give us your permission by clicking on the "I agree" button below, we plan to publish the results in academic journals and discuss the results at scientific conferences. In any publication, information will be provided in such a way that you cannot be identified.
Upon request the Institutional Review Board and regulatory authorities will be granted direct access to your original research records for verification of research procedures and/or data
Please note that email communication is neither secure nor private. Though we are taking precautions to protect your privacy, you should be aware that information sent through email could be read by a third party.
When the research is completed, our research team may save the study records for use in future research done by myself or others. We will retain this study information for up to 4 years after the study is over. The same measures described above will be taken to protect confidentiality of this study data.

Voluntary Participation/Withdrawal
Taking part in this study is voluntary. You are free to not answer any questions or withdraw at any time. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. To withdraw your consent, simply close the browser tab. Your data will be deleted from our records.

Questions
If you have any questions about this study now or in the future, you may contact Dr. Thrailkill, the Investigator in charge of this study, at (802) 656-1976 or eric.thrailkill@uvm.edu, for more information about this study. If you have questions or concerns about your rights as a research participant, then you may contact the Director of the Research Protections Office at (802) 656-5040.
You can download a pdf copy of this research information sheet here.

Participation
Your participation is voluntary, and you may refuse to participate without penalty or discrimination at any time. By continuing, you are making a decision whether or not to participate. Clicking the button below indicates that, having read the information provided on the participant information sheet, you have decided to participate.
To withdraw your consent, simply close the browser tab. Your data will be deleted from our records.
I have read and understand the above research information sheet and am ready to proceed with the study. Yes, No

Appendix 2

Monetary Choice Questionnaire (MCQ)

1. Would you prefer $54 today, or $55 in 117 days?
    a. Smaller reward today
    b. Larger reward in the specified number of days
2. Would you prefer $55 today, or $75 in 61 days?
3. Would you prefer $19 today, or $25 in 53 days?
4. Would you prefer $31 today, or $85 in 7 days?
5. Would you prefer $14 today, or $25 in 19 days?
6. Would you prefer $47 today, or $50 in 160 days?
7. Would you prefer $15 today, or $35 in 13 days?
8. Would you prefer $25 today, or $60 in 14 days?
9. Would you prefer $78 today, or $80 in 162 days?
10. Would you prefer $40 today, or $55 in 62 days?
11. Would you prefer $11 today, or $30 in 7 days?
12. Would you prefer $67 today, or $75 in 119 days?
13. Would you prefer $34 today, or $35 in 186 days?
14. Would you prefer $27 today, or $50 in 21 days?
15. Would you prefer $69 today, or $85 in 91 days?
16. Would you prefer $49 today, or $60 in 89 days?
17. Would you prefer $80 today, or $85 in 157 days?
18. Would you prefer $24 today, or $35 in 29 days?
19. Would you prefer $33 today, or $80 in 14 days?
20. Would you prefer $28 today, or $30 in 179 days?
21. Would you prefer $34 today, or $50 in 30 days?
22. Would you prefer $25 today, or $30 in 80 days?
23. Would you prefer $41 today, or $75 in 20 days?
24. Would you prefer $54 today, or $60 in 111 days?
25. Would you prefer $54 today, or $80 in 30 days?
26. Would you prefer $22 today, or $25 in 136 days?
27. Would you prefer $20 today, or $55 in 7 days?

Probability Discounting Questionnaire (PDQ)

1. Would you prefer $20 for sure, or a 1-in-10 chance (10%) of winning $80?
    a. The "for sure" reward today
    b. The larger reward with a chance of getting nothing
2. Would you prefer $20 for sure, or a 1-in-8 chance (13%) of winning $80?
3. Would you prefer $20 for sure, or a 1-in-6 chance (17%) of winning $80?
4. Would you prefer $20 for sure, or a 1-in-5 chance (20%) of winning $80?
5. Would you prefer $20 for sure, or a 1-in-4 chance (25%) of winning $80?
6. Would you prefer $20 for sure, or a 1-in-3 chance (33%) of winning $80?
7. Would you prefer $20 for sure, or a 1-in-2 chance (50%) of winning $80?
8. Would you prefer $20 for sure, or a 2-in-3 chance (67%) of winning $80?
9. Would you prefer $20 for sure, or a 3-in-4 chance (75%) of winning $80?
10. Would you prefer $20 for sure, or a 5-in-6 chance (83%) of winning $80?

11. Would you prefer $40 for sure, or a 1-in-5.6 chance (18%) of winning $100?
12. Would you prefer $40 for sure, or a 1-in-4.6 chance (22%) of winning $100?
13. Would you prefer $40 for sure, or a 1-in-3.4 chance (29%) of winning $100?
14. Would you prefer $40 for sure, or a 1-in-3 chance (33%) of winning $100?
15. Would you prefer $40 for sure, or a 1-in-2.5 chance (40%) of winning $100?
16. Would you prefer $40 for sure, or a 1-in-2 chance (50%) of winning $100?
17. Would you prefer $40 for sure, or a 2-in-3 chance (67%) of winning $100?
18. Would you prefer $40 for sure, or a 8-in-10 chance (80%) of winning $100?
19. Would you prefer $40 for sure, or a 8.6-in-10 chance (86%) of winning $100?
20. Would you prefer $40 for sure, or a 9.1-in-10 chance (91%) of winning $100?

21. Would you prefer $40 for sure, or a 1-in-2.5 chance (40%) of winning $60?
22. Would you prefer $40 for sure, or a 4.6-in-10 chance (46%) of winning $60?
23. Would you prefer $40 for sure, or a 5.5-in-10 chance (55%) of winning $60?
24. Would you prefer $40 for sure, or a 6-in-10 chance (60%) of winning $60?
25. Would you prefer $40 for sure, or a 2-in-3 chance (67%) of winning $60?
26. Would you prefer $40 for sure, or a 3-in-4 chance (75%) of winning $60?
27. Would you prefer $40 for sure, or a 8.6-in-10 chance (86%) of winning $60?
28. Would you prefer $40 for sure, or a 9.2-in-10 chance (92%) of winning $60?
29. Would you prefer $40 for sure, or a 9.5-in-10 chance (95%) of winning $60?
30. Would you prefer $40 for sure, or a 9.7-in-10 chance (97%) of winning $60?

Domain-Specific Risk-Taking (DOSPERT) Scale

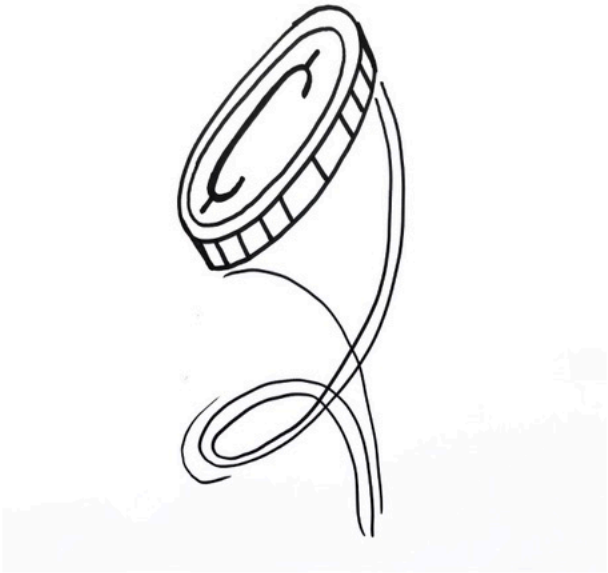
1. Admitting that your tastes are different from those of a friend.
    1. Extremely Unlikely
    2. Moderately Unlikely
    3. Somewhat Unlikely
    4. Not Sure
    5. Somewhat Likely
    6. Moderately Likely
    7. Extremely Likely
2. Going camping in the wilderness.
3. Betting a day's income at the horse races.
4. Investing 10% of your annual income in a moderate growth diversified fund.
5. Drinking heavily at a social function.
6. Taking some questionable deductions on your income tax return.
7. Disagreeing with an authority figure on a major issue.
8. Betting a day's income at a high-stakes poker game.
9. Having an affair with a married person.
10. Passing off somebody else's work as your own.
11. Going down a ski run that is beyond your ability.
12. Investing 5% of your annual income in a very speculative stock.
13. Going whitewater rafting at high water in the spring.
14. Betting a day's income on the outcome of a sporting event.
15. Engaging in unprotected sex.
16. Revealing a friend's secret to someone else.
17. Driving a car without wearing a seatbelt.
18. Investing 10% of your annual income in a new business venture.
19. Taking a skydiving class.
20. Riding a motorcycle without a helmet.
21. Choosing a career that you truly enjoy over a more secure one.
22. Speaking your mind about an unpopular issue in a meeting at work.
23. Sunbathing without sunscreen.
24. Bungee jumping off a tall bridge.
25. Piloting a small plane.
26. Walking home at night in an unsafe area of town.
27. Moving to a city far away from your extended family.
28. Starting a new career in your mid-thirties.
29. Leaving your young children alone at home while running an errand.
30. Not returning a wallet you found that contains $200.

Mixed-Gambles Task Instructions and Sample Gamble

In this experiment, you will see a series of screens where you will be asked to choose whether or not you would accept a hypothetical gamble. Please answer by pressing "Accept" or "Strongly Accept" if you would take the gamble, and "Reject" or "Strongly Reject" if you would not.

All gambles are 50/50 shots; that is, there is a 50% chance of winning the green money and a 50% chance of losing the red money.

We don't expect you to choose in any particular way, so please don't choose what you think we might want you to choose, but click on the choice you really would prefer given the option in real life. After each choice, the program will go on to the next screen, and it will tell you when you are done.



WIN $16

or

LOSE $10

Would you flip the coin?

Strongly Accept | Accept | Reject | Strongly Reject

Use the mouse to make your choice.

Dietary Questionnaire

1. Do you eat breakfast?
    a. Always
    b. Often
    c. Sometimes
    d. Never
2. Which beverage do you consume at breakfast?
    a. Milk
    b. Fruit juice
    c. Tea/coffee
    d. Water
3. At breakfast you eat:
    a. Biscuits/cakes/crackers/breakfast cereals/bread
    b. Fruit
    c. Sausages and cheese
    d. Pizza/flatbread/toast
4. Do you eat at least 2 portions (200 g) of fruit every day?
    a. Always
    b. Often
    c. Sometimes
    d. Never
5. Do you eat at least 2 portions (200 g) of vegetables every day?
    a. Always
    b. Often
    c. Sometimes
    d. Never
6. Do you usually eat a cake or a dessert at meals?
    a. Always
    b. Often
    c. Sometimes
    d. Never
7. Do you usually drink wine or beer at meals?
    a. Always
    b. Often
    c. Sometimes
    d. Never
8. Do you usually eat breakfast, lunch and dinner every day?
    a. Always
    b. Often
    c. Sometimes
    d. Never
9. Your diet:
    a. Is different every day
    b. Is different only sometimes during a week
    c. Is different only during the weekend days
    d. Is very monotonous
10. Your diet is based mainly on:
    a. High protein content foods (meat, fish, eggs, cheese, dried legumes)
    b. High carbohydrate content foods (bread, pasta, rice, potatoes, biscuits)
    c. Different foods every day
11. Your snacks are based mainly on:

a. Fruit/fruit juice/fruit and milk shakes/yogurt
b. Biscuits/crackers/bread/stick bread
c. Fried potatoes/popcorn/peanuts/soft drinks
d. Sweets/chocolate/ice cream/cakes

12. Which beverages do you usually drink between meals?
    a. Water
    b. Soft drinks (cola, orange soda, iced tea, tonic water, etc.)
    c. Wine/beer
    d. Fruit/fruit juice/fruit and milkshakes
13. Do you drink at least one glass of milk or do you eat at least one cup of yogurt every day?
    a. Always
    b. Often
    c. Sometimes
    d. Never
14. Do you drink at least 1–1.5 l of mineral water every day?
    a. Always
    b. Often
    c. Sometimes
    d. Never
15. Do you usually practice a physical activity?
    a. Always during the entire year
    b. Only in some seasons
    c. Sometimes
    d. Never
16. How many hours do you practice it?
    a. 1-2 h in a week
    b. 3-4 h in a w eek
    c. More than 4 h in a week
    d. No hour
17. What do you prefer to do during free time?
    a. Walking
    b. Watching TV/listening to music/using the computer/reading a book
    c. Practicing a sport
    d. Shopping
18. How many hours do you spend on the computer or watching TV?
    a. 1-2 h a day
    b. 3-4 h a day
    c. 5-6 h a day
    d. More than 6 h a day
19. The physical activity that you practice on a routine basis:
    a. Is tiring
    b. Is boring
    c. Stimulates you to practice sports/engage in additional activity
    d. Makes you feel well
20. Your lifestyle is:
    a. Very sedentary
    b. Sedentary
    c. Moderately active
    d. Very active