2019

Individual Differences in Decision-Making

Catelyn N. Shipp
Georgia Southern University

Individual Differences in Decision-Making

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in the *Department of Psychology*.

By

Catelyn N. Shipp

Under the mentorship of Dr. *Ty W. Boyer*

ABSTRACT

When making decisions, most people tend to avoid uncertain outcomes or risks. However, individual differences, such as optimism versus pessimism and liberalism versus conservatism, may lead to variable approaches and outcomes in the decision-making process. Thus, the goal of this research is to examine individual differences in decision-making preferences and whether these associate with personality characteristics (i.e., optimism/pessimism and conservative/liberal views). To test this, the current study involves a probabilistic gambling task, adapted from behavioral judgment and decision-making research. Participants are shown "wheel-of-fortune-like" spinner wheel stimuli divided into green, red, and gray sections. The relative proportion of each color represents the respective probability of a win, loss, or no change in a bank of points, and participants' task is to choose between two simultaneously presented wheels. In a key set of trials, participants are presented with truly ambiguous choices, in which the relative win-to-loss ratios are objectively identical, though the likelihood of neutral outcomes vary. In addition, participants complete the Revised Life Orientation Test, which measures optimistic versus pessimistic views, and the Liberal-Conservative Self-Report Scale.

Keywords: Decision-making, Optimism-Pessimism, Liberalism-Conservatism

Thesis Mentor:_____

Dr. *Ty W. Boyer*

Honors Director:_____

Dr. *Steven Engel*

April 2019
Department of Psychology
University Honors Program
Georgia Southern University

Acknowledgements

I would like to thank the University Honors Program for the amazing opportunity to create and present this undergraduate thesis project. I am very grateful for this experience which greatly enhanced my academic interests and my future career goals.

I would also like to extend a sincere thank you to Dr. Boyer, whose wisdom and guidance led me graciously through every step of this project. Under his mentorship, I was able to learn so much about the research process as it is performed in my field. His patience and knowledge were crucial aspects to the development and final success of this research.

A final thank-you goes to my family, my friends, and my fellow lab-members who all encouraged me through every hardship and who celebrated with me through every milestone and moment of success. This project would not have been possible without you.

Introduction

Decision-making involves numerous cognitive processes. Tversky and Kahneman (1992), for instance, describe decision-making as a combination of an individual's perceptions of choice outcomes (i.e., win-loss probabilities), attitudes towards ambiguity, and tendencies towards risk. Thus, decisions depend on the both the information available for each choice and on how the information is evaluated by an individual (Kwak & Huettel, 2018). Slovic (2000) provides an illustration of this concept in a study on the effects of communicating a psychiatric patient's risk for violence in probability (e.g., 10%) versus frequency formats (e.g., 10 out of 100) in a decision to release the patient from a hospital. Professionals who viewed the patient's risk of violence in a frequency format (e.g., 2 out of 10) were twice as likely to deny the patient's discharge as professionals who viewed the patient's risk of violence in a probability format (e.g., 20%). The findings suggest that the frequency format evoked a more lucid or frightening description which led to a higher decision weight despite the identical chance of violence (Slovic, 2000). Similarly, Kahneman (2011) explains how the focus of one's attention can lead to misconstrued perceptions of the chance of unlikely outcomes.

Furthermore, decision-making tasks involving visual stimuli require numerous perceptual processes that also influence the decision-making process (Kwak & Huettel, 2017; Jarvenpaa, 1990). For instance, Parkhurst and colleagues (2002) examined how salience guides visual attention and cognitive processing when one evaluates a stimulus. In their study, participants looked at a series of images while the researchers tracked eye movements. Through the eye-tracking data, the researchers found that early attentional processes select only a few of the possible stimuli to further process cognitively

(Parkhurst, Law, & Niebur, 2002). Therefore, salience, or the amount of attention devoted to part of a stimulus, can alter the decision-making process by influencing how an individual initially views and interprets the information presented (Beesley, Hanafi, Vadillo, Shanks, & Livesey, 2018). These findings are strengthened by Seeley and colleagues (2007) identification of a neural "salience network" which consists of the right anterior insula, the left anterior insular, and the dorsal anterior cingulate. Recent research shows that this salience network organizes information from the environment before the information reaches the prefrontal cortex for more complex processing, which includes decision-making (Chand & Dhamala, 2016). Thus, how an individual visually perceives a stimulus is crucial to the outcome of the decision-making process. In accordance with these findings, the present study seeks to examine if individual differences, such as one's personal tendency to be optimistic versus pessimistic or one's personal tendency to be liberal versus conservative, cause different processing and interpretation of visual stimuli, even if those stimuli should not objectively affect the decision-making process.

When making a decision, people tend to show aversion towards ambiguity by avoiding uncertain outcomes (Pulford & Gill, 2013). However, individual differences lead people to approach ambiguous decision-making tasks differently (Seale, Rapoport, & Budescu, 1995). These individual differences are partly the result of expectations created from prior experiences, which interact with ongoing perceptual processes to make sense of the complex, surrounding environment (Chabris & Simon, 2009). Furthermore, Levin and colleagues (2002) report that personality traits are critical components of the decision-making process. Important for our purposes, previous studies have shown that individual differences in personality traits may relate to ambiguity-aversion and

ambiguity-tolerance in a decision-making task involving uncertain outcomes or risks (Pulford, 2009). Specifically, those high in positive emotionality or optimism pay greater attention to positive stimuli; whereas, those high in negative emotionality or pessimism pay more attention to negative stimuli (Hainaut, Monfort, & Bolmont, 2006). Relatedly, Wenglert and Rosen (2000) define dispositional optimism as a personality trait in which individuals maintain hopeful expectations in a variety of both positive and negative situations. Thus, optimism and pessimism may affect both how an individual interprets a stimulus or an event, and the environmental cues that they initially focus on (Isaacowitz, 2005). For instance, Segerstrom (2001) found that optimists automatically directed more attention towards positive stimuli in an Emotional Stroop paradigm, while pessimists automatically focused more attention on negative stimuli. Steginga and Occhipinti (2006) offer a possible explanation to the phenomenon described above, as they found that individuals who score high in trait optimism do not experience feelings of anxiety as intensely as others do during a decision-making process. This relationship was further examined in a gambling study which found that those high in dispositional optimism maintain confidence and positive expectations while gambling, even after experiencing a loss (Gibson & Sanbonmatsu, 2004). Furthermore, Kahneman (2011) found that entrepreneurs who score high in trait optimism show a willingness to take more risks, and they often misread risks through the belief that they are making sensible decisions even when they are not. Thus, dispositional optimism (or pessimism) may lead one to irrationally consider gain and loss probabilities while making a decision (Kahneman, 2011). These biases associated with trait optimism and trait pessimism reveal the mind's tendency to see patterns in the world and to make evaluations and decisions based on

those invented patterns; however, those patterns can misconstrue the decision-making process as one may accidentally misinterpret the reality of a situation (Chabris & Simons, 2009).

Furthermore, we often see the impact of individual differences in political ideologies in real-life judgement and decision-making processes. Moreover, trait optimism and trait pessimism, as described above, may correlate to the differences in the political ideologies that we see today. As McCrae (1996) claims, one's political ideology reflects deep-rooted personality traits, for these ideologies are far more enduring than a simple preference for a current political party or a social movement. Thus, these ideologies, stemming from individual personality differences, could play an important role in understanding variability across decision-making under uncertainty. On the one hand, liberal-minded individuals tend to take a more positive view of their surroundings (Graham, Haidt, & Nosek, 2009), and they score higher in measures of openness, which means that they more easily welcome novel or unexpected experiences (McCrae, 1996; Caprara, Barbaranelli, Zimbardo, 1999). On the other hand, conservative-minded individuals tend to take a more negative view of their surroundings (Graham et al., 2009). These individuals show a more closed-minded preference for things that are predictable by behaving in a certainty-oriented and stiff manner (McCrae, 1996; Driscoll, Hamilton, & Sorrentino, 1991). Therefore, those who score high in conservativism may be characterized as more pessimistic, focusing on the negative and showing aversion to ambiguity in the midst of new experiences (Chirumbolo et al., 2004). Thus, a connection between optimism and liberalism and a connection between pessimism and conservatism may be influential in drawing conclusions from participant decisions in the current study.

It is important to note that the variability between liberal and conservative ideologies can be partially explained by more basic biological and cognitive processes. For example, previous research has suggested that gaze-cuing effects are innate and automatic shifts in attention in response to a directed cue (Hood, Driver, & Willen, 1998; Farroni et al., 2004). However, Dodd, Hibbing, and Smith (2011) found that participants who scored high in conservatism failed to show a gaze-cuing effect when asked to react to a target (e.g. a drawing of a face) displayed on a screen. In contrast, liberal participants showed a much larger gaze-cuing effect by consistently reacting to the targets that flashed on the screen (Dodd et al., 2011). Theoretically, these differences in attention may be the result of conservative-minded individuals valuing autonomy and consistency more than liberal-minded individuals, and therefore, conservatives may be less responsive to and trusting of outside influences (Dodd et al., 2011). In a later study, Dodd and colleagues (2012) found that conservative participants spent significantly more time looking at negative images than liberal participants, similar to those who score low in trait optimism as described above. Furthermore, political attitudes have been associated with physiological responses to fear and disgust (Oxley et al., 2008). For instance, individuals with lower physiological responsiveness to sudden noises and menacing pictures were more likely to support liberal ideology than those who displayed higher responsiveness to similar stimuli (Oxley at al., 2008). Thus, one's physiological responsiveness may indicate conservative or liberal preferences, and therefore, to what degree an individual accepts or rejects uncertainty and change (Oxley et al., 2008). As a result, these physiological tendencies may also reveal whether one views unexpected or ambiguous circumstances in an optimistic or a pessimistic light. These findings are

strengthened by Vigil (2010) who found that conservatives were more likely to report an "emotionally ambiguous" face as expressing a threatening emotion, taking a pessimistic view of an ambiguous stimuli, while liberals were more likely to assign a more positive emotion, such as "surprise," to the same "emotionally ambiguous" face. Therefore, these individual differences in ideologies may enhance our understanding of participant decisions in the ambiguous gamble presented in the current study.

We are often faced with ambiguous decision-making tasks in which there are no better options among different choice outcomes. Therefore, the present study seeks to identify consistencies of decision-making under uncertainty, and further, examines if the way in which individuals make those decisions relates to levels of optimism-liberalism and pessimism-conservatism as measured by our selected assessments. To do this, the current study involved a spinning wheel gambling task, loosely modeled after Smith, Chein, and Steinberg (2014). Participants were shown a pair of spinning wheels on a computer screen each divided into three sections: a win section (green), a loss section (red), and a neutral section (gray). The probability of each outcome was yoked to the size of the portion of the wheel composed of each color, and the stimuli varied across trials so as to convey high, moderate, and low probabilities of wins, losses, and neutral outcomes. With this gambling model, we strove to determine if individual differences in perception related to the likelihood that one would interpret a neutral stimulus (gray) in an ambiguity-averse or ambiguity-tolerant lens, when the rational decision would be to ignore the neutral portion of a stimulus that had no bearing on the objective probability or value structure of possible outcomes. Since the gray sections of the two wheels presented were outcome-neutral, we contrasted two choice alternatives (i.e two spinning wheels)

that illustrated equivalent relative win-to-loss ratios (i.e. green: red sections) but with different sized gray (neutral) sections to identify interesting patterns of behavior in the interpretation of ambiguous stimuli despite the equivalent outcomes displayed.

Tymula and colleagues (2012) investigated similar questions in their study that found that adolescents' risk-taking behaviors tend to be the result of a tolerance to unknown outcomes. This study used a paradigm consisting of 160 choice trials where participants were shown a certain pay-off of $5 and a gamble with a pay-off of more than $5 or a pay-off of nothing. These gambles were displayed as a mixture of 100 red and blue poker chips, with each color defined as the winning color in one-half of the trials. The participants were told that at the end of the study, one of the 160 trials would be randomly selected and the participant's decision in that trial could result in actual payment (Tymula et al., 2012). Therefore, if participants picked a gamble instead of the certain pay-off in the random selected trial, they would get to reach into a bag filled with blue and red poker chips at the conclusion of the study. If they drew the winning color specified in that round, they would win the amount that was determined in that particular trial (Tymula et al., 2012). In the risky trials, participants were offered a chance to win a certain $5 and a gamble offering a chance to win more than $5 displayed by the red and blue poker chips. In the ambiguous trials, participants had to choose between winning a certain $5 or a gamble offering a chance to win more than $5 with a gray lid covering 50 of the 100 poker chips displayed. Important for our current study were the differences in participant responses despite the equivalent win-loss likelihood (e.g., 50% chance of choosing a red poker chip and 50% chance of choosing a blue poker chip) (Ellsberg, 1961). Both colors of poker chips were the winning colors in one-half of the trials;

however, the subjects did not know whether the red or blue trial would be selected at the conclusion of the study for actual payment (Tymula et al., 2012). Therefore, an ambiguity-tolerant individual should rationally view the ambiguous gambles the same as the risky gambles, with a 50% chance of winning and a 50% of losing. In contrast, an ambiguity-resistant individual may treat the ambiguous gamble with a lesser 25% (e.g. only 25 red chips) chance of winning, aggregating the gray covering with their chances for a loss; an ambiguity-tolerant individual may behave as if there were an increased 75% (e.g. 75 red chips) chance of winning, aggregating the gray covering with their chances for a win (Tymula et al., 2012).

Moreover, Zhao, Huang, Li, Zhao, and Peng (2015) performed a study of trait dispositional optimism and decision-making as it may occur in a medical setting. The researchers showed participants graphs of cancer patient outcomes after surgery and after radiation. On the graphs, a shaded region indicated patient survival and a blank region indicated patient death. Participants were then asked to decide which should be used (i.e., surgery or radiation) on a current patient (Zhao et al., 2015). As documented in previous studies, how an individual develops a frame, or a personal perspective, of a current situation plays a crucial role in their decision-making process (Wang, 2004). For instance, individuals low in dispositional optimism tend to form negative frames; therefore, they focus more on possibly threatening stimuli (Zhao et al., 2015). In contrast, those high in dispositional optimism tend to form positive frames, focusing on the positive in a situation (Zhao et al., 2015). Thus, when participants were asked to decide which treatment to use on a current patient, those low in trait optimism were more likely to choose radiotherapy due to its high, short-term treatment survival rate, and did not

consider radiotherapy's lower, long-term survival rate in comparison to surgery (Zhao et al., 2015). Therefore, participants low in trait optimism focused greater attention to short-term outcomes and to the blank area of the graph, which indicated death, and explained their decisions in more pessimistic language instead of considering the complete nature of the graph and its representation of both short-term and long-term treatment outcomes (Zhao et al., 2015). In contrast, participants high in trait optimism were more likely to choose surgery which had a low treatment survival rate but had a high 5-year survival rate in comparison to radiotherapy (Zhao et al., 2015). As a result, those high in trait optimism demonstrated confidence in potential positive outcomes, payed more attention to long-term possibilities, and were better able to bear the chance of unfortunate circumstances (Zhao et al., 2015). Therefore, optimists were able to look beyond the threat of the short-term outcomes of surgery and to focus on the positive expectations for the increased long-term survival rates compared to those who had undergone radiotherapy (Zhao et al., 2015).

The findings listed above may be the result of the interaction of the two systems of reasoning: the rational process which logically interprets choice alternatives to decide what action to take, and the emotional process which forms affective perceptions, and in doing so can be optimistically or pessimistically biased (Bracha & Brown, 2010). System Two, or the rational process, is the only one that carefully evaluates choice outcomes while making decisions; however, the biases developed by System One, or the emotional process, continuously affect System Two (Kahneman, 2011). Therefore, these two processes work together while an individual makes a decision (Bracha & Brown, 2010), and this interaction may result in individual differences in the processing of a neutral

stimulus in an ambiguous task. Kirkpatrick and Epstein (1992) tested this model in a study that observed differences in participant choices with two identical gambles. The first gamble had a 10:100 chance of winning, and the second had a 1:10 chance of winning. Despite being told that the gambles were identical, participants showed a tendency to choose the gamble with more winning tickets (10:100), justifying their decision by the greater number of potential winners in that gamble than the 1:10 gamble (e.g., 100 winners versus 10 winners). Amsel, Close, Sadler, and Klaczynski (2009) claim that these findings were the result of the dual-process approach described above, where participants made irrational judgements due to reliance on the emotional process of following their gut-feelings about the situation. In contrast, if participants would have relied on the rational process, they would engaged in more effortful and systematic thinking, and would have realized that both gambles held identical win-loss potential (Amsel et al, 2009).

However, as Kahneman (2011) explains, a "lazy" System Two often takes a path of minimal effort by adhering to the suggestions of System One, and therefore, failing to engage in effortful thinking. For example, De Martino and colleagues (2006), initially showed participants a starting amount of money that they would receive (e.g., "You receive 50 euros"); however, they were not able to keep the entire amount. Instead, they had to choose between a risk-free option and a gamble option (De Martino, Kumaran, Seymour, & Dolan, 2006). The risk-free options were presented in both a gain-frame (e.g., "Keep 20 euros.") and a loss-frame (e.g., "Lose 30 euros.") across the trials (De Martino, Kumaran, Seymour, & Dolan, 2006). The gamble option was presented as a pie chart to visually display the winning (green) and losing (red) probabilities (De Martino,

Kumaran, Seymour, & Dolan, 2006). The participants were asked to choose between the risk-free option and the gamble option, though they both represented an equivalent win-loss potential (De Martino, Kumaran, Seymour, & Dolan, 2006). Therefore, a rational decision in this task would be to select either option, regardless of the frame. However, the results revealed that some subjects were highly influenced by the framing of the problem and chose the risk-free option only in the gain-frame, but not in the loss-frame (De Martino, Kumaran, Seymour, & Dolan, 2006). Further, fMRI results showed active firing of the amygdala, or the emotional center of the brain involved with System One, as the participants influenced by the framing of the problem made their decision. In contrast, those who were not influenced by the framing of the problem showed increased activation of the prefrontal cortex, or the rational center of the brain (De Martino, Kumaran, Seymour, & Dolan, 2006). This aligns with the rationale behind the dual-systems approach in which the emotionally-biased System One can influence the decision-making strategies of System Two (Kahneman, 2011). This concept is strengthened by what is known as the common "affect heuristic," which claims that people attend to their emotions (System One) in making judgments and decisions (System Two), oftentimes without even acknowledging that they are doing so (Slovic et al., 2002). As a result of similar findings, Chabris and Simons (2009) claim that successful decision-making relies on the ability to know when to trust personal intuitions and when to engage in more controlled thinking. These conclusions reveal crucial components as to what may explain the various preferences among optimistically-liberally-biased and pessimistically-conservatively-biased participants in the present study.

Importantly, recent research has questioned the ability of behavioral tasks to accurately measure individual differences in risk-taking and decision-making in comparison to propensity measures, such as standard questionnaires (Frey et al., 2017). Two possible explanations for these findings have emerged: a problem with the instrument, or a problem with the construct (Palminteri & Chevallier, 2018). The first explanation argues that behavioral tasks measure both a central process (e.g., risk-taking) alongside secondary processes (e.g., responses to stimuli) which may interact and consequently alter results. The second explanation argues that risk-taking and decision-making are constructs that change over time, and they should be measured with such a dynamic state in mind (Palminteri & Chevallier, 2018). For example, how a participant responds to a momentary behavioral task may not reflect how he or she will consistently respond to other decision-making tasks, while self-report measures may provide a more accurate representation of a participant's decision-making tendencies by combining previous experiences stored in the his or her memory. Therefore, behavioral tasks should be performed with an understanding that the variability found in participant responses to the tasks reveals actual changes in momentary risk-taking tendencies (Palminteri & Chevallier, 2018). Moreover, Kahnemen (2011) argues that decision-making within gambling models accurately reflects complex, real-world decisions as such tasks represent how decision-making outcomes can never be certain. Therefore, in the current study, we designed a probabilistic gambling task (PGT) modeled after Smith, Chein, and Steinberg (2014) with two wheels divided into sections colored green (win), red (loss), and gray (neutral) to investigate the differences that emerge with liberal-optimistic and conservative-pessimistic bias in a decision-making situation with some degree of

ambiguity. In many of the trials, participants will view wheels of identical win probabilities; however, we will manipulate the gray, or neutral, sections of the wheels to determine whether participants considered the gray section as a win, a loss, or neither. In addition, participants will complete the Revised Life Orientation Test (LOT-R; Scheier, Carver, & Bridges, 1994) to assess individual tendencies towards optimism and pessimism and the Liberal-Conservative Self-Report Scale (Lambert & Raichle, 2000) to measure how liberal or how conservative participants consider themselves to be.

In light of more recent research, which views dispositional optimists as viewing circumstances through "rose-colored interpretations" (Isaacowitz, 2005), we hypothesize that participants who score high in trait optimism will interpret the same display wheels differently than participants who score low in trait optimism. For instance, eye-tracking data analyzed how attention was devoted to neutral (e.g., emotionless faces) and to negative (e.g., skin cancer) stimuli among optimists and pessimists (Isaacowitz, 2005). The data revealed that optimists were more likely to avoid paying attention to negative stimuli, which suggests that optimists in the current study may also wear similar "rose-colored glasses" while processing visual information by selectively attending to the positive stimuli (e.g., green sections) and viewing the ambiguous stimuli (e.g., gray sections) in a more positive light (Isaacowitz, 2005). Furthermore, we predict that those who score high in trait optimism will also score high in liberal ideology and display similar wheel-choice patterns, as those of a liberal orientation are also more likely to avoid focusing on negative stimuli (Dodd et al., 2012). Therefore, on the one hand, we predict that ambiguity-tolerant participants who aggregate the green (win) and the gray (neutral) sections, interpreting the neutral sections of the stimuli as a win and selecting

wheels with a large green plus gray proportion, will also score high in trait optimism and in liberalism as captured by our selected assessments. On the other hand, we predict that ambiguity-resistant participants who aggregate the red (loss) and the gray (neutral) sections, interpreting the neutral sections of the stimuli as a loss and avoiding wheels with a large red (loss) plus gray (neutral) proportion, will score low in trait optimism and high in conservative ideology.

Further, we also predict that those who view the wheel in an ambiguity-tolerant lens will experience superior outcomes to those who view the wheel through an ambiguity-resistant lens. For instance, the personality systems interaction theory (PSI) says that individuals are inclined to take either an action or a state orientation, and this orientation will affect the decision-making process (Koole & Coenen, 2007). According to the findings of Kuhl (1994), an action orientation leads individuals to focus heavily on a desired goal, and therefore, results in positive expectations and good problem-solving strategies. This definition aligns neatly to that of the dispositional optimist (Wenglert & Rosen, 2000) and the liberal-minded individual (McCrae, 1996) as described above. Further, it adds an understanding to previous findings of high levels of trait optimism found among some of the top entrepreneurs who were able to see opportunities to succeed in places that others may have not (Silver, 1985). In an analysis of sixteen studies looking at the relationship between various individual differences and success, for example, it was trait optimism that appeared most consistently throughout the literature as a defining characteristic of those who experienced high levels of success (Crane & Crane, 2007). Thus, those of an action-orientation (e.g., liberal-optimists), may be more likely to outperform those of a state orientation (e.g., conservative-pessimists), as those of

a state orientation may dwell only on the negative possibilities of an event and consequently impede their ability to make effective decisions (Kuhl, 1994). Similarly, Shook and Fazio (2009) had liberal and conservative participants play a computerized game called "BeanFest" where participants decided to accept or reject differently shaped and marked beans. If the participant accepted the bean, the value of the beans with the same shape and marking were then shown (e.g. +10 or -10). Participants were told to accumulate as many points as they could (Shook and Fazio, 2009). Shook and Fazio (2009) found that liberals chose ambiguous bean types more often than conservatives in the hopes of accumulating more points (e.g., liberals took an action orientation towards the task), even though doing so ran the risk of losing points. We, therefore, hypothesize that those who score high in trait optimism and high in liberalism will take an action-orientation while engaging with our paradigm, taking the risk to play the wheels with a tolerance to ambiguity, selecting wheels with a higher proportion of the neutral (gray) area and opening the opportunity for more chances to win and ultimately leading to higher overall scores. In contrast, we predict that those who score low in trait optimism and high in conservatism will take a state-orientation while engaging with our paradigm, taking a resistant stance against ambiguity by refusing to spin wheels with a higher proportion of the neutral (gray) area and losing opportunities to win and ultimately resulting in lower overall scores.

In sum, within our particular paradigm, an individual should objectively ignore the neutral (gray) sections of the wheels, as they bear no true win or loss potential; however, we predict that a majority of participants will rely on a tolerant or resistant intuition towards ambiguity in making a decision between the two wheels presented. We

further predict that participants who view the wheels in an ambiguity-tolerant lens will obtain higher scores by taking risks on the more neutral-dense wheels in our paradigm, while the participants who view the wheels with an ambiguity-resistant lens will obtain lower scores as a result of missed chances. Finally, we predict that those who take an ambiguity-tolerant position while engaging with our paradigm will score higher in trait optimism and in liberal ideology, while those who take an ambiguity-resistant position while engaging with our paradigm will score lower in trait optimism and higher in conservative ideology.

Method

Participants

Participants consisted of 104 undergraduate students (77 female, 27 male) between the ages of 19 - 23 years (M = 19.12, SD = 1.19)[1]. Ten participants were eliminated due to predetermined exclusionary criteria. Seven participants were eliminated because they failed to respond to the objectively superior option in at least 75% of trials. Furthermore, 1 participant was eliminated because they did not respond within 3 standard deviations of the mean response time in at least 75% of trails. Lastly, 2 participants were eliminated due to technological difficulties which resulted in incomplete task and survey completion. Participants were recruited from a participant pool maintained by the Department of Psychology at Georgia Southern University using an online participant

[1] To meet the University Honors Program requirements, this sample was used for the purposes of completing this undergraduate thesis. Data collection is ongoing for final project completion.

recruitment software (i.e., SONA). All participants provided written informed consent prior to participating and received course credit for their contribution the study.

Procedure

Upon arrival, participants were greeted and given an informed consent form detailing the purpose of the study, the compensation granted for participation in the study, and the participant's freedom to withdraw at any point in time. Once the informed consent form was signed, participants were directed to a quiet, isolated cubical equipped with a 22-inch computer screen with a standard keyboard and mouse. After the participant was seated, the researcher gave verbal instructions to the participants on how to commence and progress through the spinning wheel gambling task, pausing at the end to ask for questions before the experiment began.

To begin the experiment, the participants read the written instructions provided for the wheel of fortune gambling task. These instructions informed participants that they would be shown two wheels with different win-loss probabilities and then asked to decide which wheel they would rather play. Participants were instructed that they would either accumulate (i.e., landing on a green section), lose (i.e., landing on a red), or maintain (i.e., landing on a gray) points, depending on which wheel they choose and its win-loss-neutral probabilities. Participants were also informed that the goal of the gambling task was to accumulate as many points as possible by the end of the study.

After reviewing the instructions, participants began the gambling task with 4 practice trials, where the decisions made between the two wheels presented had no effect on the participant's final score. After completing the practice trials, participants moved

into the 132 experimental trials which consisted of displays of each win-dominant (6 wheels), loss-dominant wheels (6 wheels), and ambiguous wheels (3 wheels) in a two-wheel, forced-choice format. Participants viewed two wheels at a time and used the mouse to select which of the two wheels they would rather play. After selecting a wheel, that wheel spun and landed on a green, red, or gray section contingent on the probability derived from the proportion of the chosen wheel. If the selected wheel landed on a green section, the participant won ten points; if the wheel landed on a red section, the participant lost ten points; and if the wheel landed on a gray section, the participant neither gained nor lost points. Total points were tallied and shown throughout the task, and a final score was shown at the end of the experimental trials.

After finishing the gambling task, participants completed a computerized version of the 10-item Revised Life Orientation Test (LOT-R; Scheier, Carver, & Bridges, 1994) to evaluate levels of optimism or pessimism followed by a computerized version of the Liberal-Conservative Self-Report Scale (Lambert & Raichle, 2000) to evaluate how liberal or conservative participants considered themselves to be. When finished with the assessments, participants were thanked for their participation in the study and given further details on the general purpose and predictions made by the researchers.

Stimuli

In each trial, participants played a "wheel of fortune" gambling task loosely modeled after Smith et al. (2014), with differently colored sections (see Figure 1 in Appendix A). The stimuli were developed and animated using 3DSMax, and E-Prime 3 (PST Software, Pittsburgh, PA, USA) was used for stimulus presentation and data recording. The colored sections of the wheels represented the probability of gaining 10

points (green), losing 10 points (red), or neither winning nor losing points (gray). The three outcomes (i.e. green, red, gray) varied in proportion in each trial and between the two wheels simultaneously presented to participants on the screen. Participants chose which of the two wheels to play by selecting it with a computer mouse. Fifteen different win-to-loss ratios were portrayed on the wheels throughout the game (see Table 1 in Appendix B). These included: 6 win-dominant wheels, where the chance of winning (green) was at least .50; 6 loss-dominant wheels, where the chance of losing was at least .50; and 3 ambiguous wheels, where there was an equal chance of winning (green) and losing (red) despite differing proportions of the neutral (gray) sector. Trials were constructed out of all possible pairings of all of these stimuli with purposeful oversampling of stimulus pairs with equal win and loss outcomes probabilities (i.e., the three ambiguous wheels). For instance, one wheel in an ambiguous trial could have 37.5% green, 37.5% red, and 25% gray, and would be pitted against another wheel with 25% green, 25% red, and 50% gray. These two options are identical in terms of relative win: loss potential but differ in terms of the probability of the ambiguous (e.g., neutral) component. This study is concerned with whether preferences in these trials would reliably vary across individuals. The pairing of these various wheels across trials thus evaluated the participants' attitude towards risk (towards known probabilities) and attitudes towards ambiguity (towards unknown probabilities).

In the task, the participants were shown two wheels and chose which wheel to "play," both of which either displayed equivalent expected outcomes with one wheel displaying a larger ambiguous (gray) sector, or one wheel presenting a more probable win or loss outcome than the other alternative. When a participant chose which wheel to

"play," the chosen wheel spun and landed on one of the colored-sections, depending on the win-to-loss probability of that wheel. If the selected wheel landed on a green section, "YOU WIN +10" was displayed on the screen; if the wheel landed on a red section, "YOU LOSE -10" was displayed on the screen; and if the wheel landed on a gray section, "NO CHANGE +0" was displayed on the screen before participants progressed to the next trial. In all trials, the total score was calculated and shown at the bottom of the screen.

With this paradigm, we focused on the trials that presented two wheels that illustrated equal probabilities of win and loss outcomes but that displayed varying neutral outcome probabilities. With this focus, we defined an ambiguity-tolerant strategy as one where a participant, after being shown two wheels in a forced-choice format, chose to play the wheel with a winning (green) sector plus a neutral (gray) sector that was equal to or greater than .50. In other words, ambiguity-tolerant participants were those who aggregated the winning (green) and the neutral (gray) sectors to make their judgement, and therefore, chose to play the wheel with the greatest winning (green) sectors plus neutral (gray) sectors across the trials. For example, when presented with a choice between one wheel with 37.5% green, 37.5% red, and 25% gray and another wheel with 25% green, 25% red, and 50% gray, and ambiguity-tolerant individua would tend to aggregate the green and the gray portions and select the second wheel (i.e., preferring 75% to 62.5% green plus gray). In contrast, we defined an ambiguity-resistant strategy as avoiding the wheel option that represented the largest loss (red) plus neutral (gray) sections in the forced choice presented. Therefore, ambiguity-resistant participants were those who aggregated the neutral sector (gray) and the loss sector (red) to make their

judgements, and therefore, avoided playing wheels with the largest loss (red) plus neutral (gray) sections across trials. For instance, when presented with the same choice outlined above between one wheel with 37.5% green, 37.5% red, and 25% gray and another wheel with 25% green, 25% red, and 50% gray, an ambiguity-resistant individual would tend to aggregate the red and the gray portions and select the first wheel (i.e., preferring 62.5% to 75% red plus gray). Participants completed 4 practice trials and then 132 experimental trials, which resulted in a total time of roughly 20 minutes per participant.

Self-Report Measures

Revised Life-Orientation Test (LOT-R)

After completing the gambling task, participants were given the 10-item Revised Life Orientation Test (LOT-R; Scheier, Carver, & Bridges, 1994) to assess levels of optimism and pessimism (see Appendix C). The LOT consists of 3 optimistic statements, 3 pessimistic statements, and 3 filler statements. Scores of the test are based only on items 1, 2, 4, 7, 9 and 10, with the remaining questions serving as fillers. The final scores are computed by reverse coding the responses to the pessimistic statements and adding those scores to the responses from the optimistic statements, with higher scores indicating higher levels of optimism. Sample items include “In uncertain times, I usually expect the best” and “If something can go wrong for me, it will.” Participants responded to each statement on a 5-point scale where 0=strongly disagree, 1 = disagree, 2 = neutral, 3 = agree, and 4 = strongly agree (LOT-R; Scheier, Carver, & Bridges, 1994). Internal consistency, test-retest reliability, construct validity, and predictive validity have been shown for this test (LOT-R; Scheier, Carver, & Bridges, 1994). Further, Chiesi et al’s (2013) item response theory analyses increased confidence in the assessment’s ability to

measure levels of optimism. A reliability analysis from the data in our sample also indicated adequate reliability of this measure ($\alpha = .76$).

Liberal-Conservative Self-Report Scale

After completing the LOT-R, participants completed the Liberal-Conservative Self-Report Scale (see Appendix D). In this survey, participants report how conservative and how liberal they consider themselves to be on a scale ranging from 0 (not at all conservative or liberal) to 10 (extremely conservative or liberal) (Lambert & Raichle, 2000). [2]To evaluate participant responses, the participant's conservative rating was added to a reverse-scored liberal rating, with higher numbers indicating higher levels of conservatism and lower levels of liberalism (Lambert & Raichle, 2000). These scores will be useful to test our hypothesis that those of conservative ideologies will score lower in optimism and those of liberal ideologies will score higher in optimism, and to further see the role of these individual differences in an ambiguous decision-making process.

Results

For this study, participants performed a behavioral task followed by two self-report surveys. In the PGT, participants where shown two wheels in a forced-choice format. Participants selected which wheel they would rather play to accumulate the most points in a variety of win-dominant, loss-dominant, and ambiguous trials. Participants selected win-dominant wheels in trials with clear win and loss outcomes in 94.38% of trials (*SD* = .05). Relatedly, participants scored an average of 374.15 points (*SD* = 87.47)

[2] We used a scale ranging from 0-9 for the Liberal-Conservative Self-Report Scale to align with the standard keyboard participants used to enter responses.

by the conclusion of the PGT. A Pearson's correlation was conducted to perform a manipulation check on our gambling task. The proportion of times participants chose correct, win-dominant responses in the PGT related to the total number of points they accumulated by the end of the study, r = .30, p = .004. The selection of win-dominant responses in trials with a clear win or loss outcome was related to the accumulation of points by the end of the study. Furthermore, in the ambiguous trials of the PGT, participants engaged in an ambiguity-tolerant strategy (i.e., selected the option that presented the larger summed green and gray portion) in 45.60% of trails (*SD* = .29). However, the responses on those ambiguous trails exhibited a non-normal distribution (see Figure 2., Appendix E). Thus, our results indicate that there were individual differences in the strategies participants used while engaging with the PGT. This task was followed by the Revised Life Orientation task (*M* =14.63, *SD* = 4.19) and the Liberal Conservative Self-Report Scale (*M* = 8.72, *SD* =4.40) which measured self-reported levels of optimism and self-reported levels of conservatism respectively.

Pearson's correlations were further used to analyze the data (see Table 2., Appendix F). Levels of self-reported optimism failed to relate with choice tendencies in the PGT, *r* = -.08, *p* = .434. Participants who reported high levels of trait optimism did not utilize the ambiguity-tolerant strategy, as conceptualized within our study. Furthermore, there was no relationship between self-reported levels of trait optimism and self-reported levels of conservative ideology, *r* = .16, *p* = .124 as hypothesized. Trait optimism also failed to relate with task performance, *r* = -.015, *p* = .883. Participants who scored high in trait optimism performed similarly well on the gambling task compared to participants who scored low in trait optimism. Relatedly, there was no relationship

between levels of conservativeness and task performance, $r = -.06$, $p = .559$. Participants who reported high levels of conservative ideology performed similarly well to participants who reported low levels of conservative ideology.

Furthermore, a confirmatory analysis was conducted to compare the choice tendencies and task performances of those who identified as the most and the least optimistic on our self-report measure. Participants were separated into three groups based on LOT-R results by dividing the sample into lower, middle, and upper thirds. A two-tailed, independent-samples t-test was used to compare the upper and lower third sub-samples. There was no significant difference between the choice tendencies of the highest scoring optimists and the choice tendencies of the lowest scoring optimists, $t(34) = .64$, $p = .528$. Participants in the upper third sub-sample did not appear to utilize an ambiguity-tolerant strategy more ($M = .48$, $SD = .31$) than the participants who scored in the lower third sub-sample ($M = .42$, $SD = .28$). Furthermore, a two-tailed independent-samples t-test revealed no relationship between the task performance of the highest scoring optimists and the lowest scoring optimists, $t(34) = .21$, $p = .839$. Participants who scored in the upper third sub-sample obtained a similar amount of points ($M = 379.44$, $SD = 113.01$) as the participants who scored in the lower third sub-sample ($M = 372.22$, $SD = 97.78$).

Discussion

The purpose of the current study was to examine individual differences in decision-making within an ambiguous choice-task. In the behavioral task used in this study, an individual should have objectively ignored the neutral (gray) sections of the wheels, as they bore no true win or loss potential; however, we predicted that participants

would rely on a tolerant or resistant intuition towards ambiguity in making a decision between the two wheels presented. We further predicted that participants who viewed the wheels in an ambiguity-tolerant lens would obtain higher scores by taking risks on the more neutral-dense wheels in our paradigm, while the participants who viewed the wheels with an ambiguity-resistant lens would obtain lower scores as a result of missed chances. Finally, we predicted that those who took an ambiguity-tolerant position while engaging with our paradigm would score higher in trait optimism and in liberal ideology, while those who took an ambiguity-resistant position while engaging with our paradigm would score lower in trait optimism and higher in conservative ideology. However, the results of this study failed to support the project's hypotheses. The PGT and our selected self-assessments failed to correlate with personality traits with decisions and performance on the choice task. Therefore, the results suggest that optimism-liberalism and pessimism-conservatism may not relate to one another, nor to the differences in decision-making as measured by choice tendencies and performance within our behavioral task.

Participant responses in the current study failed to align with the findings of previous research. For instance, Hainaut, Monfort, and Bolmont (2006) found that those who scored high in trait optimism payed more attention to positive stimuli, while those who scored high in trait pessimism payed more attention to negative stimuli. However, the Life Orientation Test (LOT-R; Scheier, Carver, & Bridges, 1994) failed to reveal an association of optimism and pessimism with those expected behavioral tendencies in the PGT. The current study revealed no relationship between trait optimism and an ambiguity-tolerant strategy, which we conceptualized as an optimistic strategy, within

our task. Relatedly, there was no relationship between trait pessimism and an ambiguity-resistant strategy, which we conceptualized as a pessimistic strategy, within our task.

Furthermore, previous research suggests an association between the personality traits of optimism and pessimism with liberal and conservative political ideologies respectively. For instance, Graham et al. (2009) found that conservative-minded individuals take a more pessimistic view of the world around them, while liberal-minded individuals take a more optimistic view of the world around them. Thus, we hypothesized that those who scored high in liberal ideology would also score higher in trait optimism and would use the ambiguity-tolerant strategy defined within our task. Similarly, we hypothesized that those who scored high in conservative ideology would score lower in trait optimism and would use the ambiguity-resistant strategy defined within our task. Yet, the results of our experiment failed to support that claim as there was no relationship between the personality traits nor the political ideologies as measured by our selected assessments.

Lastly, we suspected that those who scored high in trait optimism-liberalism would approach the PGT with an action orientation, as defined by Kuhl (1994), which would result in improved performance. However, there was no relationship between trait optimism and performance outcomes within our ambiguous task. These findings, however, do align with the research conducted by Tenney, Logg, and Moore (2015) which suggests that high levels of trait optimism are not always associated with improved performance outcomes. Similarly, we predicted that those who scored high in liberal ideology would outperform those who scored high in conservative ideology based on the findings of Shook and Fazio (2009). Yet, there was also no relationship with task

performance and political ideology within this particular paradigm, as those who reported high levels of conservative ideology performed just as well on the PGT as those who reported high levels of liberal ideology.

Ultimately, the current study fails to support the hypotheses grounded on previous research that individual differences in optimism-liberalism and pessimism-conservatism would relate to decisions and performance within an ambiguous choice-task. Nonetheless, the PGT was effective in evaluating individual differences in decision-making across a number of win-dominant, loss-dominant, and ambiguous trails. We did see that there were individual differences in decision-making across participants and across trials; however, self-reported levels of optimism-liberalism and pessimism-conservativism were not observed to be the driving factors behind those differences. Furthermore, all participants experienced controlled conditions (e.g., same researcher, room, lighting, etc.) while performing the gambling task, which was an effective tool for minimizing potential confounding variables.

Nonetheless, this study had several limitations that should be addressed in future research. For example, due to time limitations, the current study's sample size was below the number needed for optimal power. Therefore, future data collection will continue for final project completion. Also, the selected self-assessments failed to reflect behavioral patterns and to correlate with one another as the past literature would have suggested (Scheier, Carver, & Bridges, 1994; Lambert & Raichle, 2000). Thus, selecting different self-assessments may be beneficial to determining whether the personality traits in question really do relate to one another and to the behavioral differences we saw in the choice-task. Furthermore, this study was performed within a small and somewhat select

subset of the population (i.e., undergraduate psychology students at Georgia Southern University); therefore, the findings of the current study may not be externally valid as they may not be generalizable beyond this limited sample. Relatedly, there was a disproportionate ratio of female: male participants, so gender may have played a role in the findings presented in this study. Lastly, in the view that behavioral tasks represent variability in momentary risk-taking tendencies, a limitation of the current project was that there was no repeated testing to measure potential changes in participant responses (Palminteri & Chevallier, 2018). Perhaps a follow-up replication of this study may show more systematic differences among participant choices and a stronger relationship among those patterns to the selected measures of optimism-liberalism and pessimism-conservatism.

In conclusion, this study failed to support the hypothesis that self-reported levels of optimism-liberalism and pessimism-conservatism would relate with choice tendencies and performance outcomes within an ambiguous choice-task. Our results indicate that there were individual differences in choice tendencies within the crucial ambiguous trials of our paradigm; however, trait optimism-liberalism and pessimism-conservatism do not appear to be the driving factors behind those differences. Therefore, future research should examine other potential factors that may explain the differences in decision-making under ambiguous conditions. Furthermore, replication of the current study with a more generalizable sample and different self-report measures for optimism-pessimism and political ideology may also be beneficial to further understand how these individual differences play a role in the decision-making process. Future research could also replicate the ambiguous-choice task used in this project while adding strength to the

element of ambiguity presented in the neutral (gray) sections of this task. Perhaps increasing the level of uncertainty associated with the ambiguous area (e.g., the gray sector of the wheel serving as a “lid” covering a potential win or loss outcomes) would result in more differentiated behavioral responses.

References

Amsel, E., Close, J., Sadler, E., & Klaczynski, P. A. (2009). College students' awareness of irrational judgments on gambling tasks: A dual-process account. *The Journal of Psychology: Interdisciplinary and Applied, 143*(3), 279-292. doi:10.3200/JRLP.143.3.293-317

Ayal, S., Rusou, Z., Zakay, D., & Hochman, G. (2015). Determinants of judgment and decision making quality: The interplay between information processing style and situational factors. *Frontiers in Psychology, 6*.

Beesley, T., Hanafi, G., Vadillo, M. A., Shanks, D. R., & Livesey, E. J. (2018). Overt attention in contextual cuing of visual search is driven by the attentional set, but not by the predictiveness of distractors. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 44*(5), 707-721. doi:10.1037/xlm0000467

Bracha, A. B., D.J. (2010). Affective Decision-Making: A Theory of Optimism-Bias. *SSRN Electronic Journal*. doi:10.2139/ssrn.1581531

Chabris, C., & Simons, D. (2010). *The invisible gorilla: And other ways our intuitions deceive us*. New York, NY, US: Crown Publishers/Random House.

Chand, G. B., & Dhamala, M. (2016). The salience network dynamics in perceptual decision-making. *NeuroImage, 134*, 85-93. doi:10.1016/j.neuroimage.2016.04.018

Chiesi, F., Galli, S., Primi, C., Borgi, P. I., & Bonacchi, A. (2013). The accuracy of the Life Orientation Test–Revised (LOT-R) in measuring dispositional optimism: Evidence from item response theory analyses. *Journal of Personality Assessment, 95*(5), 523-529. doi:10.1080/00223891.2013.781029

Chirumbolo, A., Livi, S., Mannetti, L., Pierro, A., & Kruglanski, A. W. (2004). Effects of need for closure on creativity in small group interactions. *European Journal of Personality, 18*(4), 265-278. doi:10.1002/per.518

Crane, F., & C. Crane, E. (2007). *Dispositional Optimism and Entrepreneurial Success* (Vol. 10).

Darryl A. Seale, A. R., David V. Budescu. (1995). Decision Making Under Strict Uncertainty: An Experimental Test of Competitive Criteria. *Organizational Behavior and Human Decision Processes, 64*(1), 65-75.

Darryl A. Seale, A. R., David V. Budescu. (1995). Decision Making Under Strict Uncertainty: An Experimental Test of Competitive Criteria. *Organizational Behavior and Human Decision Processes, 64*(1), 65-75.

Darryl A. Seale, Amnon Rapoport, David V. Budescu. (1995). Decision Making under Strict Uncertainty: An Experimental Test of Competitive Criteria. *Organizational Behavior and Human Decision Processes, 64*(1), 65-75. doi: 10.1006/obhd.1995.1090.

De Martino, B., Kumaran, D., Seymour, B., & Dolan, R. J. (2006). Frames, Biases, and Rational Decision-Making in the Human Brain. *Science (New York, N.Y.), 313*(5787), 684-687. doi:10.1126/science.1128356

Dodd, M. D., Balzer, A., Jacobs, C. M., Gruszczynski, M. W., Smith, K. B., & Hibbing, J. R. (2012). The political left rolls with the good and the political right confronts the bad: connecting physiology and cognition to preferences. *Philosophical Transactions of the Royal Society B: Biological Sciences, 367*(1589), 640-649. doi:10.1098/rstb.2011.0268

Dodd, M. D., Hibbing, J. R., & Smith, K. B. (2011). The politics of attention: Gaze-cuing effects are moderated by political temperament. *Attention, Perception, & Psychophysics, 73*(1), 24-29. doi:10.3758/s13414-010-0001-x

Driscoll, D., Hamilton, D., & M. Sorrentino, R. (1991). *Uncertainty Orientation and Recall of Person-Descriptive Information* (Vol. 17).

Ellsberg, D. (1961). Risk, Ambiguity, and the Savage Axioms. *The Quarterly Journal of Economics, 75*(4), 643-669.

Farroni, T., Johnson, M. H., & Csibra, G. (2004). Mechanisms of eye gaze perception during infancy. *J Cogn Neurosci, 16*(8), 1320-1326. doi:10.1162/0898929042304787

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

Glaesmer, H., Rief, W., Martin, A., Mewes, R., Brähler, E., Zenger, M., & Hinz, A. (2012). Psychometric properties and population-based norms of the Life Orientation Test Revised (LOT-R). *British Journal of Health Psychology, 17*(2), 432-445. doi:10.1111/j.2044-8287.2011.02046.x.

Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal Of Personality And Social Psychology, 96*(5), 1029-1046. doi:10.1037/a0015141.

Hainaut, J. P., Monfort, V., & Bolmont, B. (2007). *Trait-anxiety dependence of movement time performance in a bimodal choice task in subjects exposed to moderate anxiogenic conditions* (Vol. 409).

Hood, B. M., Willen, J. D., & Driver, J. (1998). Adult's eyes trigger shifts of visual attention in human infants. *Psychological Science, 9*(2), 131-134. doi:10.1111/1467-9280.00024

Isaacowitz, D. M. (2005). The Gaze of the Optimist. *Personality and Social Psychology Bulletin, 31*(3), 407-415. doi:10.1177/0146167204271599

Jarvenpaa, S. L. (1990). Graphic displays in decision making: The visual salience effect. *Journal of Behavioral Decision Making, 3*(4), 247-262. doi:10.1002/bdm.3960030403

Kahneman, D. (2011). *Thinking, fast and slow*. New York, NY, US: Farrar, Straus and Giroux.

Kirkpatrick, L. A., & Epstein, S. (1992). Cognitive-experiential self-theory and subjective probability: Further evidence for two conceptual systems. *Journal of Personality and Social Psychology, 63*(4), 534-544. doi:10.1037/0022-3514.63.4.534

Koole, S. L., & Coenen, L. H. (2007). Implicit self and affect regulation: Effects of action orientation and subliminal self-priming in an affective priming task. *Self and Identity, 6*(2-3), 118-136.

Kuhl, J. (1994). Action versus state orientation: Psychometric properties of the Action Control Scale (ACS-90). *Volition and personality: Action versus state orientation, 47*, 56.

Kwak, Y., & Huettel, S. (2018). The order of information processing alters economic gain-loss framing effects. *Acta Psychologica, 182*, 46-54. doi:10.1016/j.actpsy.2017.11.013

Lambert, A. J., & Raichle, K. (2000). Liberal-Conservative Self-Report Scale.

Levin, I. P., Gaeth, G. J., Schreiber, J., & Lauriola, M. (2002). A new look at framing effects: Distribution of effect sizes, individual differences, and independence of types of effects. *Organizational Behavior and Human Decision Processes, 88*(1), 411-429. doi:10.1006/obhd.2001.2983

Levin, I. P., Gaeth, G. J., Schreiber, J., & Lauriola, M. (2002). A new look at framing effects: Distribution of effect sizes, individual differences, and independence of types of effects. *Organizational Behavior and Human Decision Processes, 88*(1), 411-429. doi:10.1006/obhd.2001.2983

McCrae, R. R. (1996). Integrating the levels of personality. *Psychological Inquiry, 7*(4), 353-356. doi:10.1207/s15327965pli0704_10

McElroy, T., & Dowd, K. (2007). Action orientation, consistency and feelings of regret. *Judgment and Decision Making, 2*(6), 333-341.

Olsen, R. A. (2004). Research Elsewhere: Optimism, Pessimism and Gambling: The Downside of Optimism. *Journal of Behavioral Finance, 5*(2), 127-129.

Oxley, D. R., Smith, K. B., Alford, J. R., Hibbing, M. V., Miller, J. L., Scalora, M., . . . Hibbing, J. R. (2008). Political attitudes vary with physiological traits. *Science, 321*(5896), 1667-1670. doi:10.1126/science.1157627

Palminteri, S. & Chevallier, C. (2018). Can we infer inter-individual differences in risk-taking from behavioral tasks? *Frontiers in Psychology*, *9*(21), 1664-1078. doi: 10.3389/fpsyg.2018.02307

Parkhurst, D., Law, K., & Niebur, E. (2002). Modeling the role of salience in the allocation of overt visual attention. *Vision Res, 42*(1), 107-123.

Pulford, B. D. (2009). Is luck on my side? Optimism, pessimism, and ambiguity aversion. *The Quarterly Journal of Experimental Psychology, 62*(6), 1079-1087. doi:10.1080/17470210802592113

Pulford, B. D., & Gill, P. (2014). Good luck, bad luck, and ambiguity aversion. *Judgment and Decision Making, 9*(2), 159-166.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A reevaluation of the Life Orientation Test. *Journal of Personality and Social Psychology, 67*(6), 1063-1078. doi:10.1037/0022-3514.67.6.1063

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Revised Life Orientation Test.

Seale, D. A., Rapoport, A., & Budescu, D. V. (1995). Decision making under strict uncertainty: An experimental test of competitive criteria. *Organizational Behavior and Human Decision Processes, 64*(1), 65-75. doi:10.1006/obhd.1995.1090

Seeley, W. W., Menon, V., Schatzberg, A. F., Keller, J., Glover, G. H., Kenna, H., Greicius, M. D. (2007). Dissociable Intrinsic Connectivity Networks for Salience Processing and Executive Control. *The Journal of Neuroscience, 27*(9), 2349.

Segerstrom, S. C. (2001). Optimism and attentional bias for negative and positive stimuli. *Personality and Social Psychology Bulletin, 27*(10), 1334-1343. doi:10.1177/01461672012710009

Shook, N., & Fazio, R. (2009). *Political Ideology, Exploration of Novel Stimuli, and Attitude Formation* (Vol. 45).

Silver, A. D. (1985). *Entrepreneurial megabucks: the 100 greatest entrepreneurs of the last 25 years*. New York: Wiley.

Slovic, P. (2000). *The perception of risk*. London, England: Earthscan Publications.

Slovic, P., Finucane, M., Peters, E., & MacGregor, D. G. (2002). The affect heuristic. In T. Gilovich, D. Griffin, D. Kahneman, T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment.* (pp. 397-420). New York, NY, US: Cambridge University Press.

Smith, A. R., Chein, J., & Steinberg, L. (2014). Peers increase adolescent risk taking even when the probabilities of negative outcomes are known. *Developmental Psychology, 50*(5), 1564-1568. doi:10.1037/a0035696

Steginga, S. K., & Occhipinti, S. (2006). Dispositional optimism as a predictor of men's decision-related distress after localized prostate cancer. *Health Psychology, 25*(2), 135-143. doi:10.1037/0278-6133.25.2.135

Tenney, E. R., Logg, J. M., & Moore, D. A. (2015). (Too) optimistic about optimism: The belief that optimism improves performance. *Journal of Personality and Social Psychology, 108*(3), 377–399. Doi:10.1037/pspa0000018.supp

Tversky, A., Kahneman, D., Gentner, D., Collins, A., Fischhoff, B., Hoch, S. J., & Loewenstein, G. F. (1992). Inferential aspects and judgment under uncertainty. In T. O. Nelson & T. O. Nelson (Eds.), *Metacognition: Core readings.* (pp. 377-436). Needham Heights, MA, US: Allyn & Bacon.

Tymula, A., Belmaker, L. A. R., Roy, A. K., Ruderman, L., Manson, K., Glimcher, P. W., & Levy, I. (2012). Adolescents' risk-taking behavior is driven by tolerance to

ambiguity. *PNAS Proceedings of the National Academy of Sciences of the United States of America, 109*(42), 17135-17140. doi:10.1073/pnas.1207144109

Vigil, J. (2010). *Political leanings vary with facial expression processing and psychosocial functioning* (Vol. 13).

Vittorio Capara, G., Barbaranelli, C., & Zimbardo, P. (1999). *Personality Profiles and Political Parties* (Vol. 20).

Wang, X. T. (2004). Self-framing of risky choice. *Journal of Behavioral Decision Making, 17*(1), 1-16. doi:10.1002/bdm.454

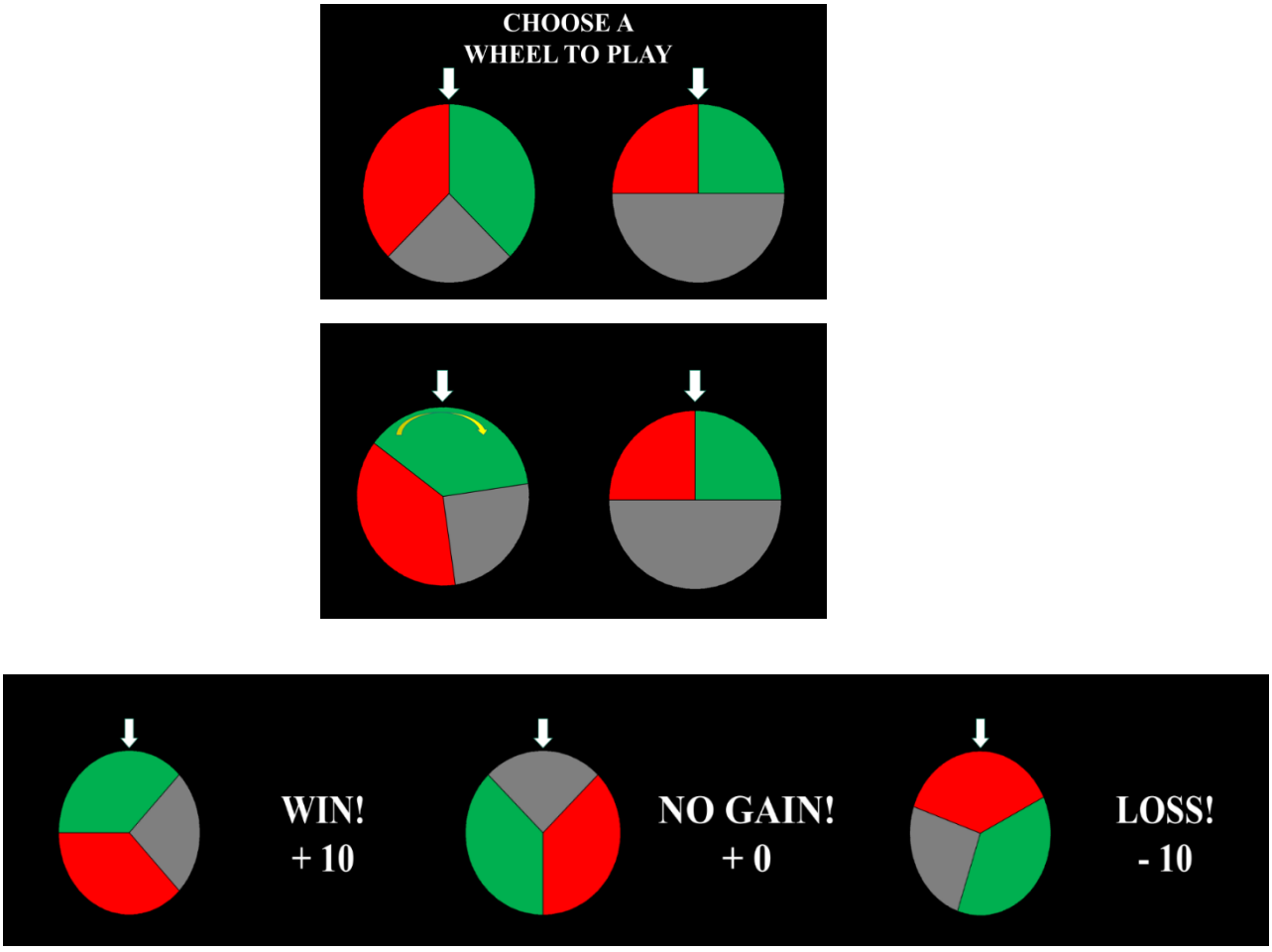
Wenglert, L., & Rosén, A.-S. (2000). *Measuring optimism-pessimism from beliefs about future events* (Vol. 28).

Zhao, X., Huang, C., Li, X., Zhao, X., & Peng, J. (2015). Dispositional optimism, self-framing and medical decision-making. *International Journal of Psychology, 50*(2), 121-127. doi:10.1002/ijop.12079

Appendix A

Figure 1.

This figure shows the sequential steps of the gambling paradigm. First, participants were asked which of the two wheels they would like to play. Upon selection, the chosen wheel spun and landed on an outcome based on the win-loss probability of that wheel. If the spinner landed on a green section, the participant won 10 points. If the wheel landed on a red section, the participant lost 10 points. If the wheel landed on a gray section, the participant neither won nor lost points.



Appendix B

Table 1.

Stimulus values used to construct all possible stimulus pairings in the PGT.

Wheel Number	Win Probabilities	Loss Probabilities	No Gain Probabilities	Wheel Type
1	.4375	.4375	.125	Ambiguous
2	.375	.375	.25	Ambiguous
3	.25	.25	.50	Ambiguous
4	.375	.50	.125	Loss-Dominant
5	.25	.625	.125	Loss-Dominant
6	.125	.75	.125	Loss-Dominant
7	.25	.50	.25	Loss-Dominant
8	.125	.625	.25	Loss-Dominant
9	0.0	.75	.25	Loss-Dominant
10	.50	.375	.125	Win-Dominant
11	.625	.25	.125	Win-Dominant
12	.75	.125	.125	Win-Dominant
13	.50	.25	.25	Win-Dominant
14	.625	.125	.25	Win-Dominant
15	.75	0.0	.25	Win-Dominant

Appendix C

Life Orientation Test- Revised

0 = *Strongly Disagree* 1 = *Disagree* 2 = *Neutral* 3 = *Agree* 4 = *Strongly Agree*

1) In uncertain times, I usually expect the best.

   0 1 2 3 4

2) It's easy for me to relax.

   0 1 2 3 4

3) If something can go wrong for me, it will.

   0 1 2 3 4

4) I'm always optimistic about my future.

   0 1 2 3 4

5) I enjoy my friends a lot.

   0 1 2 3 4

6) It's important for me to keep busy.

   0 1 2 3 4

7) I hardly ever expect things to go my way.

   0 1 2 3 4

8) I don't get upset too easily.

   0 1 2 3 4

9) I rarely count on good things happening to me.

   0 1 2 3 4

10) Overall, I expect more good things to happen to me than bad.

    0 1 2 3 4

Appendix D

Liberal-Conservative Self-Report Scale

1) How conservative do you consider yourself to be?

Not at all Conservative 0 1 2 3 4 5 6 7 8 9 10 *Extremely Conservative*

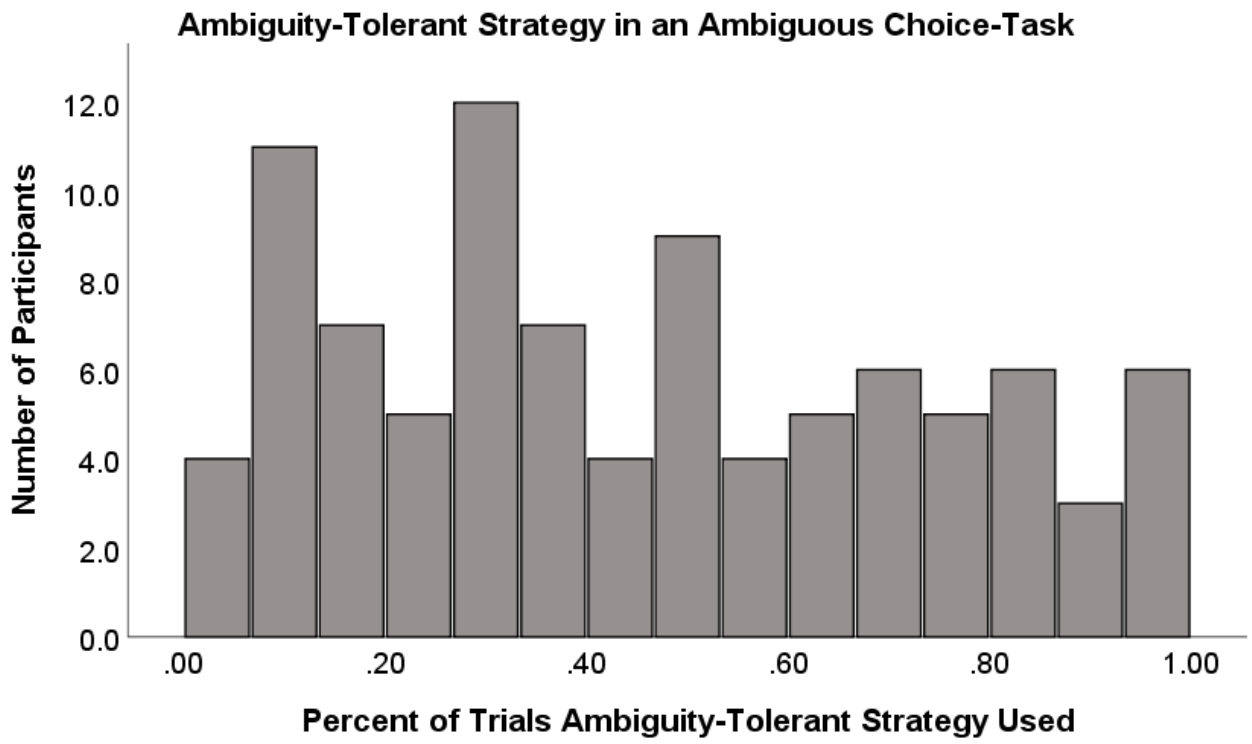
2) How liberal do you consider yourself to be?

Not at all Liberal 0 1 2 3 4 5 6 7 8 9 10 *Extremely Liberal*

Appendix E

Figure 2.

This figure illustrates how participants interacted with the crucial ambiguous trials of the PGT. As shown in the figure, there were individual differences in how participants interacted with the ambiguous choice-task. Some participants utilized an ambiguity-tolerant strategy or an ambiguity-resistant strategy, as defined within our study, more than others; however, these individual differences did not correlate with self-reported levels of optimism nor with self-reported levels of conservative ideology as we had hypothesized.



Appendix F

Table 2.

Levels of self-reported optimism failed to relate with an ambiguity-tolerant strategy on the PGT, an increased performance on the PGT, nor to self-reported levels of conservative ideology.

	Win-Choice	Ambiguity-Tolerance	Total Points	Optimism	Conservatism
Win-Choice	-				
Ambiguity-Tolerance	.26 (.012) *	-			
Total Points	.30 (.004) *	.04 (.699)	-		
Optimism	-.09 (.388)	-.08 (.434)	-.02 (.883)	-	
Conservatism	-.06 (.539)	.12 (.261)	-.06 (.559)	.16 (.124)	-

*Correlation (two-tailed)