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The Five-Factor Model As Predictor Of Performance On Decision-Making Tasks

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THE FIVE-FACTOR MODEL AS PREDICTOR OF PERFORMANCE ON DECISION-MAKING TASKS

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ABSTRACT

Prior research on personality and decision-making has failed to use adequate measurement of both constructs. The current research extended the previous literature by incorporating multiple measures of decision-making as well as the NEO-PI-3, a psychometrically sound measure of the five-factor model of personality. Five measures of decision-making were used which addressed various aspects of adequate decision-making. The current research also included a measure of cognitive ability (WAIS-IV Vocabulary) as previous research has noted a strong correlation between cognitive ability and decision-making. Results indicated that cognitive ability significantly predicted performance on three decision-making tasks. In regard to personality, Agreeableness was the only personality trait found to be a significant predictor of any decision-making tasks.

CHAPTER 1

INTRODUCTION

Decision-making has no pre-established rules and no certain outcomes, yet individuals are able to make decisions on a daily basis. Decision-making is a response to a certain situation in which the decision-maker faces many possible actions, considers the probabilities of outcomes for each action, and evaluates the potential consequences of the outcomes (Hastie & Dawes, 2001). Individuals employ a number of strategies to aid in decision-making. One such strategy is the use of heuristics—strategies which often produce a correct solution (Matlin, 2009). While these strategies are robust in decision-making situations in that they usually produce good decisions without much cost or effort, they also produce errors and biases (Hastie & Dawes, 2001). In using heuristics, important information regarding the situation is often ignored, making the decision prone to error (Hastie & Dawes, 2001; Sanna, Small, & Cook, 2004). Examples of heuristics used in decision-making include representativeness, anchor and adjustment, and availability.

The representativeness heuristic involves making a decision based on the representativeness of the sample; if a sample is representative, fits the normal expectations of a given population, then it is deemed to be part of that population (Hastie & Dawes, 2001; Matlin, 2009). A classic example is that individuals are more likely to say that Linda is a bank teller and active in the feminist movement when told Linda is a

young, bright, out-spoken woman who is concerned with issues of discrimination and social justice, even though the probability of Linda being both a bank teller and active in the feminist movement is less than Linda being a bank teller. The description of Linda fits with individuals' conceptions of feminists, so Linda is judged to also be part of that population (Hastie & Dawes, 2001).

The anchor and adjustment heuristic includes making an initial approximation (anchor) and adjusting it in regard to additional information. Unfortunately, the adjustments are often insufficient and do not extend far enough from the initial anchor (Hastie & Dawes, 2001; Matlin, 2009; Sanna et al., 2004). Use of the anchor and adjustment heuristic indicates that decision-making is based on a pre-established anchor and subsequent information has little effect on the decision. This heuristic is present in the use of stereotypes; for example, when meeting an individual of a particular race, we often do not adjust far enough from our stereotypes (anchor) to adequately understand the individual's unique characteristics, and therefore make incorrect inferences about the individual based on the stereotype (Matlin, 2009).

The availability heuristic occurs when the individual judges probability in terms of the ease of thinking of relevant examples (Matlin, 2009; Sanna et al., 2004). For instance, if in regard to a specific city many occurrences of violence come easily to mind, one is more likely to judge that city as more violent than a city to which fewer examples come to mind.

Decision-Making as a Skill

Decision-making competence, the ability of the individual to use normative decision-making skills accurately and consistently in the decision-making process,

includes the ability to properly use heuristics but also the awareness that such strategies are not always sufficient for making a competent decision (Bruine de Bruin et al., 2007). Decision-making competence directly addresses heuristics and biases by assessing deficiencies in various decision-making skills in regard to accuracy and consistency (Parker & Fischhoff, 2005).

Performance on decision-making tasks is also related to individual differences in basic cognitive ability, indicating an underlying, consistent difference in reasoning abilities (Stanovich & West, 1998). Decision-making competence encompasses many cognitive abilities, but it is believed to incorporate four basic skills: assessing beliefs, assessing values, combining beliefs and values to identify choices, and meta-cognitive understanding of one's abilities (Parker & Fischhoff, 2005).

The skill of assessing beliefs involves accurately judging the probability of the occurrence of an event. For example, an adequate ability to assess beliefs would result in an accurate estimate of the probability of getting the flu in the next two months. The assessing values skill involves being receptive to relevant task changes while ignoring irrelevant changes. For example, an individual who makes the same decision regarding ground beef whether it is presented as 80% lean or 20% fat is effectively utilizing this skill. This skill also includes the ability to ignore past costs and simply focus on future outcomes. For example, a good financial decision-maker would not consider the money already spent on a project but would focus on the probability of future success or failure of the project. The integration skill (i.e. combining beliefs and values) requires accuracy and consistency in applying decision rules. For example, when choosing a new laptop computer, an individual may have certain requirements, or rules (i.e. low cost, large

screen, average processing speed), which should lead to a specific outcome. Consistent and accurate application of such rules should lead to the correct option. Finally, meta-cognitive understanding is conceptualized as having accurate confidence in one's decisions. For example, an individual who is simply guessing at the answer to a true/false question would be accurate in indicating that she is 50% confident in her decision. However, if she was simply guessing and stated that she was 75% confident, she would be overconfident and indicating poor metacognitive skills in the decision-making domain (Parker & Fischhoff, 2005).

Decision-making skills may also reflect the ability to avoid or correctly apply quick-and-easy, although not always correct, heuristics. These skills also reflect the ability to avoid common decision-making obstacles. The skills manifest themselves in decision-making tasks such as consistency in risk perception, resistance to framing, and applying decision rules.

The framing effect occurs when the decision-maker formulates different decisions in regard to the same information presented in opposing frames. For example, one may decide that 80% lean ground beef is better than 20% fat ground beef even though they are the same. In most experimental manipulations of this effect, the problem statement is presented in two different frames in which the wording is slightly different but the information is the same (Hastie & Dawes, 2001). The general decision trend is to make riskier decisions in regard to negative frames and less risky decisions in regard to positive frames (Fagley, Miller, & Jones, 1999). People are more likely to take risks to avoid a loss and less likely to take risks to achieve a gain (Levin, Gaeth, Schreiber, & Lauriola,

2002). The framing effect offers support for the idea that decision-making is less logical and systematic and is based more on perception.

Risk perception is believed to be related to the availability heuristic—judging probability by the frequency of occurrences in memory. While this heuristic may result in accurate risk perception due to the availability of commonly occurring events in memory, it is also subject to individual differences in memory content and contextual factors (i.e. exposure to uncommon risks) that can distort risk perceptions (Herwig, Pachur, & Kurzenhauser, 2005). For example, one may decide that getting attacked by a shark is very likely because of the number of news stories about shark attacks even though the risk of this occurring is actually low. Using the availability heuristic to judge risk can lead to incorrect estimates of risk because individuals base the estimates on instances in memory which often do not match the instances in reality (Herwig et al., 2005). Affect is also important in probability judgments of risk and is similar to the availability heuristic because it relies on memory and the affective associations of memory. For instance, individuals are often more concerned with the perceived possibility than the actual probability of an event, which helps explain why perception of risk is often inconsistent (Slovic, Peters, Finucane, & MacGregor, 2005).

Applying decision rules assesses the accuracy of decisions and the individual's ability to integrate information in order to make a decision. An individual's ability to apply decision rules accurately has been found to be highly correlated with general cognitive ability, suggesting that this component of decision-making requires adequate or superior cognitive ability to be performed successfully (Bruine de Bruin et al., 2007).

While decision-making competence focuses on the processes and skills of decision-making rather than the outcomes, it is related to outcomes of good decision-making, thus supporting the idea that better decision-making skills will often result in better decisions (Bruine de Bruin et al., 2007; Parker & Fischhoff, 2005). In addition, decision-making competence is associated with real-world outcomes of decision-making, thus increasing its ecological validity beyond simple laboratory tasks. Among a sample of adolescents, decision-making competence has shown negative relationships with "maladaptive" risk behavior (i.e. antisocial disorders, externalizing behavior, delinquency, substance use, sexual activity) and positive relationships with positive family and peer environments (Parker & Fischhoff, 2005).

The effect of age on decision-making seems to be different among decision-making tasks. For example, younger adults perform better than older adults on resistance to framing and applying decision rule tasks. However, older adults perform better on tasks which require the recognition of social norms and resisting the use of sunk costs (e.g. money already spent) in making a decision (Bruine de Bruin et al., 2007).

Decision-Making Tasks

Many decision-making tasks used in research incorporate an element of risk in assessing the adequacy of decision-making skill. The Iowa Gambling Task (IGT) has been widely used to assess decision-making ability. It was developed to identify decision-making deficits in individuals with damage to the prefrontal cortex (Barry & Petry, 2008). Participants are required to selects cards from four decks that vary in probability and magnitude of rewards and punishments. Decks which provide immediate large gains also provide net losses over time (Franken & Muris, 2005). Less risky decision-making

on the IGT is considered to be better performance (i.e. better decision-making). Research has indicated gender differences in IGT performance, with men performing better than women (Bolla, Eldreth, Matochik, & Cadet, 2004). Research also indicates that performance on the IGT improves over multiple trials, but the gains in performance continue to occur for less well educated participants who perhaps rely more on emotion-based decisions (Evans, Kemish, & Turnbull, 2004).

Research relating the IGT to personality constructs has focused on two systems: the behavioral inhibition system (BIS) and the behavioral approach system (BAS). The BIS is believed to mediate reactions to expected punishment, while the BAS is believed to mediate reactions to expected reward (Franken & Muris, 2005). These personality constructs are usually measured by the BIS/BAS scale. This measure of personality includes components of the BIS (behavioral inhibition system)—anxiety in the face of potential punishment—and the BAS (behavioral approach system)—response to reward situations. Reward responsiveness and fun seeking are subscales of the BAS component (Franken & Muris, 2005, Suhr & Tsanadis, 2007). Good performance on the IGT has been found to be positively related to BAS, in particular the reward responsiveness component of the system (Franken & Muris, 2005). Conversely, Suhr & Tsanadis (2007) found poor IGT performance to be related to high reward responsiveness and fun seeking. These conflicting results require clarification and perhaps demand the use of more nuanced measures of personality.

Better decision-making does not always mean making less risky decisions as measured by the IGT. The Balloon Analogue Risk-Taking Task (BART) is a measure of decision-making in which better decisions are considered to be those in which the

participant takes more risks. In this task, the participant is required to pump up a series of balloons. Each pump of a balloon earns points, but also increases the chances that the balloon may explode. The balloons vary on the probability of explosion (i.e. 1/128, 1/32, and 1/8). After each pump the participant has the option to "collect" all the points earned on that balloon into a permanent fund. Thus, greater risk-taking (i.e. more pumps) results in greater rewards, but the participant also has a chance of losing all points (Vigilet-Colet, 2007). The task requires the participant to balance potential gain by adding to accrued points or potential loss of the points earned on one balloon (Bornovalova et al., 2009).

Performance on the BART has frequently been investigated in regard to impulsivity. Bornovalova et al. (2009) found those low in impulsivity and sensation-seeking to be more averse to risk when the magnitude of the reward or loss was greater. When compared to those high in impulsivity and sensation-seeking, those low on these traits are likely more sensitive to potential loss or are balanced in sensitivity to gains or losses. Vigil-Colet (2007) found BART performance to be positively correlated with functional impulsivity—the tendency to adopt impulsive decision-making when this strategy is perceived to elicit positive consequences. These results seem contrary to similar research with the IGT which found no correlation between IGT performance and impulsivity (Franken & Muris, 2005). It may be that personality traits are differentially related to risky decision-making depending on the advantages of risk-taking in the decision context. These incongruent results may also be due to the fact that the researchers used different measures of impulsivity. Again, it would appear that a more consistent means of measuring personality traits is warranted.

Individual performance on decision-making tasks tends to be consistent across tasks (Bruine de Bruin, Parker, & Fischhoff, 2007). Stanovich and West (1998) found significant correlations among a variety of reasoning and decision-making tasks. One task required participants to choose between one of two options based on statistical probabilistic information or concrete personal information. For example, the participant is presented with a scenario in which an individual is interested in buying a Volvo or a Saab. Positive information given by consumer surveys, repair statistics, and expert polls about the Volvo are presented along with one negative review by a close friend. The participant is to choose between buying the Volvo or the Saab. Preference for the Volvo indicates reliance on a large body of statistical information, whereas preference for the Saab indicates preference for salient personal information. The researchers also included the Watson selection task in which the individual must choose which of 4 cards (P, Q, not-P, not-Q) to flip over in order to determine the truth or falsity of a rule (i.e. "if Baltimore is on one side of the ticket, then 'plane' is on the other side of the ticket," p.165), and evaluation of logical syllogisms in which half of the items were logical, but unbelievable and half of the items were illogical, but believable (i.e. "All mammals walk. Whales are mammals. Conclusion: Whales walk," p. 165).

Stanovich and West (1998) also found significant correlations among the previously described reasoning tasks and tasks measuring the use of heuristics. A measure of outcome bias—a heuristic defined as the tendency to rate a decision which resulted in a positive outcome more highly than a decision which resulted in a negative outcome despite the fact that the latter decision was based on more acceptable information (i.e. better odds of winning)—and a measure of if-only thinking—a heuristic

defined as the tendency to have different responses to outcomes based on different counterfactual alternatives that might have occurred (i.e. becoming more upset with a negative outcome when it is easy to imagine a positive outcome)—both showed consistency with other measures of decision-making and reasoning.

Bruine de Bruin et al. (2007) found that individuals performed consistently across the tasks within their Adult Decision-Making Competence battery. These tasks included resistance to the framing effect, the recognition of social norms, under or overconfidence in one's decision, the ability to adequately apply decision rules, consistency in perceiving risk across different situations, and resistance to the consideration of sunk costs (i.e. disregarding the amount of money already spent in an endeavor when considering whether or not to continue in the endeavor). These findings indicate that errors in decision-making are not random, but that individual's portray consistent differences in how they reason and make decisions (Stanovich & West, 1998). This lends support to the conceptualization of individual differences in decision-making skill as a viable construct.

Trait Correlates of Decision-Making

Individual differences in decision-making as a viable construct is further supported by research which has found various individual difference variables to be related to decision-making. Research has indicated relationships between decision-making and reasoning tasks and various measures of cognitive ability such as SAT score and performance on Raven Matrices and the comprehension subtest of the Nelson-Denny Reading Test (Stanovich & West, 1998).

Anxiety is also related to decision-making in that dispositional anxiety is positively related to a bias toward making risk-avoidant decisions. Both social anxiety

and trait anxiety have been found to be related to risk-avoidant decision-making. Furthermore, the relationship between trait anxiety and risk-avoidant decision-making was found to be relatively unchanged when negative mood was controlled (Maner et al., 2007). High trait anxiety is also correlated with impaired decision-making as measured by the Iowa Gambling Task (Miu, Heilman, & Houser, 2008). When comparing a clinical sample of anxiety disordered patients to those with other psychological disorders (i.e. mood and learning), the anxiety patients exhibited more risk avoidance than both clinical groups as well as a non-clinical control group (Maner et al., 2007).

Trait anxiety has also been found to be positively associated with importance given to confirmatory evidence and negatively associated with the importance given to disconfirmatory evidence. Participants were presented with two jars, each containing a different ratio of colored beads (e.g. jar A: 80 blue beads/20 white beads, jar B: 80 white beads/20 blue beads). The jars were then placed out of site of the participant. The researcher chose a jar and presented beads one at a time to the participant. After each bead was presented, the participants indicated from which jar the bead was drawn and the relative probability that it could have come from that jar. This continued for 20 trials. The researchers were able to evaluate how participants adjusted their hypotheses regarding which jar the bead came from depending on whether they were presented with evidence which confirmed (i.e. another white bead after indicating that the first white bead came from jar B) or disconfirmed (i.e. a blue bead after indicating that the previous white bead had come from jar B) their hypothesis. Individuals with high trait anxiety tended to use evidence that confirmed their hypotheses and tended to disregard evidence which

disconfirmed their hypotheses when making adjustments to their previous hypothesis (Bensi, Giusberti, Nori, & Gambetti, 2010).

Research has noted that state anxiety may better account for the association between trait anxiety and decision-making. For example, Bensi et al. (2010) found that trait anxiety was negatively correlated with the amount of evidence requested to make a decision. Given the relative proportion of colored beads in two jars, participants with high trait anxiety requested to see fewer beads chosen from a jar before they chose which jar the bead was taken from. However, state anxiety was also negatively correlated with the amount of evidence requested. When it was entered into the model, the relationship between trait anxiety and evidence needed for a decision was no longer significant. The variance of trait anxiety was better accounted for by state anxiety.

Other personality traits have also been investigated in regard to their relationship with decision-making. For example, perfectionism may be influential in risky decision-making in which the rules for reward and punishment are stated explicitly. Perfectionism predicted performance on the Game of Dice Task (GDT) in which the participants knew the number of trials to be conducted and the relative gains and losses of each alternative. However, perfectionism did not predict performance on the Iowa Gambling Task (IGT) in which participants are unaware of the amount of a gain or loss associated with each alternative (Brand & Altstotter-Gleich, 2008). More specifically, perfectionism in regard to concern over mistakes was positive correlated with non-risky GDT performance. Similarly, obsessiveness was also found to be negatively associated with importance given to confirmatory evidence. Participants who exhibited high obsessiveness tended to not use evidence which confirmed their hypotheses. Obsessiveness was also found to be

positively associated with the amount of evidence requested in order to make a decision. Individuals high in obsessiveness tended to request to see more beads before deciding from which jar the bead was taken (Bensi et al., 2010).

Personality: The Five-Factor Model

While investigation into the relationship between personality traits and decision-making has utilized numerous personality traits, there has yet to be a thorough investigation of decision-making and personality traits based on a specific personality theory. Furthermore, most of the investigations into this relationship have failed to utilize measures of personality with sound psychometric qualities. The current study seeks to utilize the Five Factor Model (McCrae & Costa, 1987) in order to explain how personality traits may account for individual differences in decision-making ability. Previous studies have utilized versions of the most psychometrically sound measure of this model—the NEO-PI—but have either failed to find significant results (Brand & Alstotter-Gleich, 2008) or have used it with only one measure of decision-making (Hilbig, 2008).

Broadly defined, personality is an individual's characteristic patterns of thought, feeling, and behavior. One way researchers have conceptualized personality is as a set of traits—internal dispositions in socio-emotional functioning which tend to be stable over time and are usually conceptualized in bipolar terms (McAdams, 2006). Many researchers agree that personality as a trait can best be understood within the context of the Five Factor Model (Pervin, 2000). This theory is supported by research noting the substantial genetic basis of personality and the stability of personality over time. The Five Factor Model states that personality traits, as basic tendencies, interact with the

environment in shaping psychological structures such as habits, values, skills, schemas, and relationships (Allik & McCrae, 2002). In this sense, personality has causal and predictive value because it is the basic tendency of the individual toward certain attitudes, goals, roles, and relationships (John & Srivastava, 1999).

The five personality traits (the Big Five) within this model are Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (DeYoung, 2006). These five traits may be simply described as follows (John & Srivastava, 1999):

Openness to Experience: intellectual, imaginative, and open-minded

Conscientiousness: orderly and responsible

Extraversion: talkative, assertive, and energetic

Agreeableness: good-natured, trustful, and cooperative

Neurotic: easily upset and restless

Each of these traits may be further understood by describing the fundamental characteristics of individuals who are high and low in each domain. It is important to note that within each trait domain both high and low characteristics may be advantageous. While some characteristics of high or low trait presentation may seem more socially desirable, this does not negate the adaptability of the other, perhaps less socially desirable, characteristics (McCrae & Costa, 2010).

Individuals high in Openness are curious, willing to consider new ideas and unconventional values, and experience emotions more intensely than those low in this trait. Conversely, those low in Openness tend to be conservative in their beliefs and values and conventional in behavior. They tend to prefer familiar things and experience

less intense emotions. However, low Openness is not equivalent to authoritarianism or intolerance. Characteristics of individuals high in Conscientiousness include being strong willed, determined, and reliable. Individuals low in Conscientiousness tend to be less exacting and perhaps more hedonistic in their orientation. Individuals high in Extraversion are sociable, assertive, optimistic, and enjoy excitement. Those low in Extraversion (i.e. introverts) are reserved and independent. While introverts prefer to be alone and are not keen on excitement or stimulation, this does not mean that introverts are socially anxious or unhappy. Introversion should be considered the absence of extraversion, not the other end of the polarity. Individuals high in Agreeableness are essentially altruistic. They are sympathetic, eager to help others, and tend to believe the best about other people. Individuals low in Agreeableness are generally skeptical, egocentric, antagonistic, and competitive. It is important to note that being either high or low in Agreeableness may be beneficial depending on the individual's environment. While altruistic behavior is something to be admired, critical thinking and a competitive spirit are also desirable qualities. High Neuroticism is characterized by the tendency to experience negative affect. It is also associated with a proneness to irrational ideas, general lack of impulse control, and poor coping with stress and interpersonal relationships. Individuals who are low in Neuroticism are emotionally stable. They may be characterized as calm, relaxed, and able to cope with stressful situations effectively (McCrae & Costa, 2010).

Research has indicated that personality is related to decision-making primarily in terms of risk-taking behavior and the use of heuristics. Lauriola and Levin (2001) utilized a short adjective checklist as their measure of the Big Five personality traits and a forced

choice decision task as the measure of decision-making in which choices varied in outcome (gain or loss), value of the outcome, and the probability of the outcome. Participants were forced to choose between one of two contracts, one representing the risky option and the other a non-risky option. The contracts were of equal expected value in terms of the amount of money at stake and whether it was framed as a potential loss or a potential gain. The risky contract also presented information regarding the probability of the outcomes. The researchers found that high Openness and low Neuroticism predicted greater risk-taking when the contracts were presented as a potential gain, and high Neuroticism was associated with greater risk-taking when the contracts were presented as a potential loss. Additionally, Openness, Neuroticism, and Extraversion significantly predicted risk-taking when the goal was to achieve a gain rather than to avoid a loss (Lauriola & Levin, 2001).

In regard to risky decisions and the framing effect, Levin et al. (2002) investigated the relationships between the Big Five personality traits, as measured by The Big Five Personality Inventory (Digman, 1990), and risky decision-making depending on framing effects. They presented participants with one of two scenarios which were objectively equivalent but differed in regard to framing. In the positive condition participants were told to indicate their preference for program A (1/3 of individuals will succeed in reducing risk of heart disease) or program B (1/3 chance of the individuals reducing cholesterol and 2/3 chance that none of the individuals will reduce their cholesterol) on a 7-point scale with the definite choice of either option A or B at the ends of the continuum. The negative condition required the same type of response but the information was presented differently. Program A included that 2/3 of individuals will

fail to reduce their risk of heart disease and Program B included 1/3 chance that none of the individuals would fail to reduce cholesterol and 2/3 chance that all of the individuals would fail to reduce cholesterol. As expected, risk taking was greater to avoid a loss than to achieve a gain. In regard to personality traits, the researchers found that individuals with high Neuroticism, low Openness, high Conscientiousness, and low Agreeableness were most likely to show the expected preference of risk to avoid loss. Individuals with low Extraversion, high Openness, and low Conscientiousness qualities were more likely to choose a riskier option in general.

In regard to the use of heuristics, Hilbig (2008) utilized the NEO personality inventory and the classical city-size task to investigate the relationship between personality traits and the use of the recognition heuristic. Participants were presented with a list of pairs of cities and indicated which city in each pair they believed to have a larger population. The pairs of cities were matched so that a familiar city was paired with an unfamiliar city, and the familiar city was the correct choice in half of the items. The scores are calculated by finding the absolute difference between choosing the familiar city when it is the larger city and choosing the familiar city when it is not the larger city. A score of zero indicates use of the recognition heuristic because always choosing the familiar city will result in an absolute difference of zero. Any score different from zero indicates that the participant used some other information to come to a conclusion. Results indicated that high Neuroticism predicted increased use of the recognition heuristic in which inferences are based solely on recognition, ignoring other knowledge sources. The addition of the other four personality factors as predictors did not yield an increase in predictive power. Furthermore, the researchers indicated that this effect was

not mediated by accessibility of the participant's knowledge (Hilbig, 2008). In other words, the positive relationship between Neuroticism and the use of the recognition heuristic is not altered by the individual's knowledge of city populations.

The level of Openness also influenced the impact of anchoring effects on decision-making. McElroy and Dowd (2007) used a short, ten item inventory of the Big Five personality traits and used anchor tasks (i.e. the length of the Mississippi River is more or less than 200 or 20,000 miles; the number of African nations in the United Nations is more or less than 85 or 25) to examine decision-making. Individuals with high levels of Openness were more influenced by high or low anchors than individuals with low levels of Openness in that they gave higher or lower estimates in accordance with the presented high or low anchor. Furthermore, when presented with a high anchor, level of Openness was positively related to estimate size (i.e. as Openness increased, the estimate increased in size). None of the remaining four personality traits significantly predicted anchor effects (McElroy & Dowd, 2007).

The Current Study

Lacking within the current personality and decision-making research is adequate measurement of personality constructs. Previous research has failed to utilize one of the most psychometrically sound personality instruments: the NEO-PI. Utilizing such an instrument may provide a solid basis for extending the current research to other populations and contexts. Prior research has used a conglomeration of personality traits with loosely defined characteristics. The Five Factor Model offers a cohesive framework from which to build future research and theory.

Prior research in regard to personality and decision-making also failed to include a variety of decision-making tasks. The current research extended the relevant literature by using multiple measures of decision-making which sample from a variety of skills and constructs within the decision-making domain. This allowed for more nuanced explanations of relationships between personality traits and various decision-making skills.

Based in previous findings, the current research investigated the relationship between the big five personality traits and measures of decision-making. Specifically, the current research utilized the most psychometrically sound measure of personality traits in order to investigate the predictive power of personality traits on various decision-making tasks. That is, we employed the current version of the NEO inventories to assess the Five Factor Model of personality. Furthermore, the proposed research utilized both paper-and-pencil and computer based decision-making tasks which cover multiple decision-making skills. We used tasks which address risk, framing effects, and applying rules. The IGT and the BART offer measures of risk-aversion and risk-seeking, respectively, as they apply to good decision-making. The three measures taken from the A-DMC address the decision-making skills of perceiving risk, applying rules to make a decision, and avoiding the framing effect. The research also included a measure of vocabulary to control for variability due to differences in cognitive ability, which has been found to be related to decision-making ability (Stanovich & West, 1998).

CHAPTER II

METHOD

Participants

A power analysis was conducted using a test that all regression coefficients are equal to 0 in the population. First, we assumed a desired power of .80. Then, six predictor variables for main effects were assumed (five personality scores on the NEO-PI-3 and the WAIS-IV Vocabulary subtest) and five interaction effects (the WAIS-IV Vocabulary subtest interacting with each personality trait). Assuming a moderate effect size of R^2= .15, 123 participants were needed to achieve a power of .80.

Participants were recruited from a subject pool of undergraduate students at the University of North Dakota. Participants were offered course credit or monetary compensation ($20) for their participation. Due to time constraints, the final sample included 113 participants who ranged in age from 18 to 42 (M = 20.40, SD = 3.61). The sample included 40 freshmen, 36 sophomores, 15 juniors, 20 seniors, and 2 students who were in the fifth year. The sample consisted of 82 women and 31 men.

Measures

The Adult Decision-Making Competence (A-DMC) measure was used to assess decision-making competence (Bruine de Bruin et al., 2007). Following from the development of the Youth Decision-Making Competence measure, the A-DMC includes

tasks related to skills which are necessary for normatively competent decision-making. Across nearly 100 total items this measure includes six tasks including resistance to framing, recognizing social norms, under/overconfidence, applying decision rules, consistency in risk perception, and resistance to sunk costs. Internal consistency, test-retest reliability, and correlations between tasks support the validity of the A-DMC as a measure of the unified construct of decision-making competence. The A-DMC also shows significant predictive validity in that is has been found to be associated with better decision outcomes (Bruine de Bruin et al., 2007). The three subtests of the A-DMC to be used in the present study are the resistance to framing task, the consistency in risk perception task, and the applying decision rules task.

The resistance to framing task includes 14 problems of two types. The first type requires the participant to indicate his or her relative choice between two options. For example, the problem states that a pesticide is threatening the lives of 1,200 endangered animals; the participant must then indicate his or her preference on a 1 (definitely would choose A) to 6 (definitely would choose B) scale with Option A resulting in 600 animals being saved for sure and Option B resulting in a 75% chance 800 will be saved and a 25% chance that no animals will be saved. Other item contexts include tax laws, disease outbreak, and investment in the stock market; the exact quantities and probabilities in each scenario also vary (Bruine de Bruin et al., 2007).

The second type of problem in this task requires the participant to indicate his or her judgment on a 1 (definitely no) to 6 (definitely yes) scale in regard to a product or situation. For example, presented with the information that 35% of graduating seniors say they have never cheated during their college career, the participant is asked, "how would

you rate the incidence of cheating at your university?" Other contexts include condom effectiveness, test performance, and cancer treatment. The resistance to framing items are repeated later in the survey, but the frames are reversed to reflect a negative frame. For example, 35% of those who did not cheat becomes 65% who did cheat, and the options in regard to the first example become certain death for 600 animals if Option A is used and a 75% chance that 400 animals will be lost and a 25% chance that 1,200 animals will be lost if Option B is used (Bruine de Bruin et al., 2007). Good decision-making would be indicated by consistent choices between the two presentations of the same information.

The 20-item consistency in risk perception task asks the participant to indicate his or her estimate as to the chance of a specific event happening to him or her at two points in the future. First, participants indicate the probability of each event occurring in the next year, and then they are asked to indicate the likelihood of each event occurring in the next five years. Examples of such events include getting in a car accident, dying from any cause, dying in a terrorist attack, and being a victim of robbery (Bruine de Bruin et al., 2007; W. Bruine de Bruin, personal communication, September 23, 2009). Good decision-making would be indicated by equal or higher estimates for the events occurring in the next 5 years than for events occurring in the next year.

The 10 item applying decision rules task requires the participant to choose which of five DVD players the hypothetical individual consumer would buy. The DVD players are described in regard to the four unique qualities—picture quality, sound quality, programming options, reliability of brand—on a scale of 1 (very low) to 5 (very high). All of the DVD players are equally priced. For example, the participant would read the following statement, "LaToya only wants a DVD player that got a 'Very High' rating on

Reliability of Brand," and then choose the DVD player (A, B, C, D, or E) which he or she believes best suits LaToya's desire. Better decision-making includes choosing the correct DVD player depending on the desired qualities presented in the scenario.

The Iowa Gambling Task (IGT) is a computerized decision-making task which measures risky decision-making. For the IGT, higher quality decisions are associated with less risk-taking. During the task, participants select cards from four decks. Each deck of cards has a different distribution of monetary gains and losses: two decks have negative expected value (i.e. high gains of $100 per trial but also infrequent high losses) and two decks have positive expected value (i.e. low gains of $50 per trial and relatively low losses). Adaptive performance requires remembering the payoffs and losses to identify the decks with the positive expected value. The dependent measure is the proportion of cards chosen from the low-risk decks over the last 50 trials. Participants complete a total of 100 trials (Henninger, Madden, & Huettel, 2010).

The Balloon Analogue Risk Task is a computerized decision-making task which measures risky decision-making. Contrary to decisional quality on the IGT, higher quality decisions on the BART are associated with higher risk-taking. Participants view a series of 10 virtual balloons and earn money by pumping up each balloon. Each key press pumps up the balloon and adds one cent to the participant's winnings. There is a low level of risk involved with popping the balloon. Decision quality is defined as the average number of pumps on the balloons on which the participants stop pumping and take the money (Henninger et al., 2010).

The NEO Personality Inventory (NEO-PI-3) is a 240 item self-report measure of the five personality traits in the Five Factor Model. Participants are to report the degree of

agreement with the statements on a five point scale from 1 (strongly disagree) to 5 (strongly agree). The NEO-PI-3 offers a domain score for each of the five personality traits: Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C). Scores may also be obtained for the six facets within each domain as follows:

N: anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability

E: warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions

O: fantasy, aesthetics, feelings, actions, ideas, and values

A: trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness

C: competence, order, dutifulness, achievement striving, self-discipline, and deliberation

The NEO-PI-3 has shown excellent validity and reliability across many investigations. It has also shown good psychometric properties in the evaluation of personality traits cross-culturally (McCrae & Costa, 2010).

The Vocabulary subtest of the fourth edition of the Wechsler Adult Intelligence Scale (WAIS-IV) is a 30 item measure of verbal ability. Participants are asked to provide definitions for the presented vocabulary words which become increasingly more difficult (Lichtenberger & Kaufman, 2009). Of all the WAIS-IV subtests, Vocabulary provides the best estimate of overall cognitive ability. In factor analytic studies, it consistently yields the highest factor loading on g (Sattler & Ryan, 2009).

Procedures

After giving informed consent, participants were administered the WAIS Vocabulary followed by the PANAS. Participants were then administered the two computer-based tasks, the IGT and the BART. This was followed by the three paper-and-pencil decision-making tasks. Finally, the participants completed the NEO-PI-3. Upon completion of all tasks, participants were debriefed regarding the purpose of the study and were given additional information regarding how they may follow-up on the results of the research.

CHAPTER III

RESULTS

The primary analyses were conducted using a series of simultaneous multiple regression analyses. The predictor variables included were the Vocabulary subtest of the WAIS-IV and the five measures of the personality (Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness). The criterion variables were the five decision making tasks: Iowa Gambling Task, Balloon Analogue Risk Task, and three subtests of the Adult Decision Making Competence measure (Resistance to Framing, Applying Decision Rules, and Consistency in Risk Perception). Means and standard deviations for each of the six predictors and each of the five dependent variables are presented in Table 1.

Table 1. Means, Standard Deviations, and Ranges

	Mean	Standard Deviation	Range
WAISVocabulary	11.29	2.19	6.00 – 17.00
Neuroticism	29.44	11.31	20.00 – 78.00
Extraversion	53.96	10.83	20.00 – 76.00
Openness	50.39	10.39	28.00 – 80.00
Agreeableness	51.91	12.07	20.00 – 80.00
Conscientiousness	54.45	10.82	22.00 – 80.00
IGT	4.19	8.03	-17.33 – 20.00
BART	26.42	11.87	4.39 – 57.14
Resistance to Framing	0.97	0.41	0.00 – 1.93
Applying Decision Rules	0.78	0.14	0.40 – 1.00
Consistency in Risk Perc.	0.75	0.09	0.55 – 0.95

To test for potential interactions effects between WAIS-IV Vocabulary and each of the five personality traits, each of the six predictor variables were centered (score minus mean), and the products of the centered WAIS-IV Vocabulary and each of the five personality factors were calculated. These interaction predictors were then entered into the regression model for each dependent variable after the main effects had been removed.

When using multiple regression analysis it is important that the predictor variables approach independence (e.g. Knight, 1984). As the correlation between two variables approaches unity, regression coefficients can become unstable and inaccurate. Knight (1984) suggests a correlation of .8 as an unacceptable correlation between two predictor variables. The bivariate correlations between the predictor variables and the criterion variables are presented in Table 3. An examination of these correlations suggests an acceptable level of collinearity.

The six predictor variables were entered into a simultaneous multiple regression analysis in which each of the predictor variables was tested after all other variables were in the regression equation. The analyses were conducted separately for each criterion variable and the results of the analyses are presented in Tables 2, 4, 5, 6, and 7. The significance of each predictor variable was tested with degrees of freedom of 1 and 106. The reported slope coefficient estimates the amount of change in decision making performance associated with one unit change in the predictor variable. The beta weight is a standardized slope coefficient that allows a comparison of the predictive strength of each of the predictor variables. The squared semi-partial correlation represents the

proportion of variance in decision making performance accounted for by each of the predictor variables after all other variables were in the regression equation.

The results of the analysis of the Iowa Gambling Task (IGT) indicate that the overall model was not significant, $R^2 = .063$, $R^2_{adj} = .009$, $F(6, 112) = 1.178$, $p = .323$. The summary of the regression coefficients presented in Table 3 indicates that none of the predictors significantly contributed to the model. None of the interactions significantly predicted performance on the IGT.

Table 2. Regression Results for Iowa Gambling Task

	B	β	t	part r
WAISVocab	.521	.142	1.425	.134
Neuroticsm	-.016	-.023	-.181	-.017
Extraversion	.021	.029	.276	.026
Openness	.130	.168	1.667	.157
Agreeableness	.014	.022	.215	.020
Conscientious	-.031	-.042	-.356	-.033
WAISxNeuro	-.065	-.201	-1.299	-.122
WAISxExtra	.013	.042	.377	.035
WAISxOpen	.022	.077	.653	.061
WAISxAgree	-.067	-.211	-1.795	-.169
WAISxConsc	-.049	-.135	-1.036	-.097

** Significant at .01 level
* Significant at .05 level

WAIS-IV Vocabulary and each of the Big Five personality factors were entered into the model as predictors of performance on the Balloon Analogue Risk Task (BART). Regression results indicate that the overall model was not significant, $R^2 = .054$, $R^2_{adj} = .001$, $F(6, 112) = 1.013$, $p = .421$. The summary of regression coefficients presented in Table 4 indicates that none of the predictors significantly contribute to the model. However, the interaction of WAIS-IV Vocabulary and Openness to Experience ($\beta = -.256$, $p = .029$) significantly predicted performance on the BART.

Table 3. Correlations of Predictor and Criterion Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.WAISV	--															
2.IGT	.18	--														
3.BART	.10	.14	--													
4.RTF	-.34**	-.24*	-.09	--												
5.ADR	.54**	.32**	.29**	-.34**	--											
6.PCR	.16	.25**	-.01	-.02	.23*	--										
7.Neuro	.02	.01	.05	.04	.01	-.09	--									
8.Extra	-.15	.04	.11	.13	-.09	-.003	-.32**	--								
9.Open	.25**	.21*	.16	-.13	.16	-.13	.14	.12	--							
10.Agree	.03	.03	.02	.22*	-.06	-.17	-.32**	.10	.06	--						
11.Consc	.11	-.02	-.11	-.03	.02	.02	-.57**	.03	-.10	.28**	--					
12.VocNeuro	.17	-.04	-.11	-.23*	.01	-.04	.08	-.32**	-.06	-.15	.12	--				
13.VocExtra	-.05	.07	-.03	.10	.08	.07	-.29**	.31**	.01	-.07	.04	-.31**	--			
14.VocOpen	.11	.06	-.18	.05	-.05	-.09	-.05	-.01	.31**	.16	.02	.24*	.06	--		
15.VocAgree	-.01	-.10	-.05	.01	-.11	-.14	-.16	-.08	.21*	.25**	.05	-.26**	.001	.35**	--	
16.VocCons	-.22	-.08	.13	.21*	-.07	-.07	.13	.02	.02	.05	-.07	-.63**	.09	-.17	.17	--

** Correlation is significant at .01 level (2-tailed)

* Correlation is significant at .05 level (2-tailed

Post hoc analysis of the simple slopes of BART performance on Openness to Experience at the mean of WAIS-IV Vocabulary and one standard deviation above and below the mean indicated that BART performance improves as Openness to Experience increases at a low level of verbal ability (b_1 = .455, t(109) = 4.606, p < .05). However, no such effect is present at the mean (b_1 = .219, t(109) = 1.788, p > .05) or high (b_1 = -.018, t(109) = -.123, p > .05) levels of verbal ability.

Table 4. Regression Results for Balloon Analogue Risk Task

	B	β	t	part r
WAISVocab	.532	.098	.980	.093
Neuroticsm	.016	.016	.124	.012
Extraversion	.122	.111	1.066	.101
Openness	.126	.110	1.087	.103
Agreeableness	.040	.041	.407	.038
Conscientious	-.129	-.118	-.993	-.094
WAISxNeuro	.042	.088	.576	.053
WAISxExtra	-.013	-.028	-.259	-.024
WAISxOpen	-.108	-.256	-2.209*	-.205
WAISxAgree	-.008	-.017	-.147	-.014
WAISxConsc	.083	.154	1.202	.122

** Significant at .01 level
* Significant at .05 level

The results of the simultaneous multiple regression using the Vocabulary subtest of the WAIS-IV and each of the Big Five personality factors to predict performance on the Resistance to Framing subtest of the Adult Decision Making Competence measure (ADMC) are presented in Table 5. Regression results indicate that the overall model was significant, R^2 = .198, R^2_{adj} = .152, F(6, 112) = 4.292, p = .001. The summary of the regression coefficients presented in Table 4 indicates that the predictors of WAIS-IV Vocabulary and Agreeableness significantly contributed to the model. As performance on WAIS-IV Vocabulary (β = -.304, p = .002) improved, decision-making performance as

measured by the Resistance to Framing task improved, as a lower score of this task indicates better performance. As the personality trait of Agreeableness ($\beta = .267$, $p = .005$) increased, performance on the Resistance to Framing task suffered. None of the interactions significantly predicted performance on the Resistance to Framing task.

Table 5. Regression Results for Resistance to Framing

	B	β	t	part r
WAISVocab	-.059	-.305	-3.239**	-.284
Neuroticsm	.007	.202	1.715	.151
Extraversion	.005	.135	1.394	.122
Openness	-.004	-.100	-1.051	-.092
Agreeableness	.009	.267	2.836**	.249
Conscientious	.001	.027	.242	.021
WAISxNeuro	-.003	-.191	-1.326	-.116
WAISxExtra	.001	.064	.620	.054
WAISxOpen	.003	.183	1.698	.148
WAISxAgree	-.001	-.085	-.765	-.067
WAISxConsc	.000	.015	.116	.010

** Significant at .01 level
* Significant at .05 level

The results of the simultaneous multiple regression using the Vocabulary subtest of the WAIS-IV and each of the five personality factors to predict performance on the Applying Decision Rules task of the ADMC measure are presented in Table 6. Regression results indicate that the overall model was significant, $R^2 = .301$, $R^2_{adj} = .262$, $F(6, 112) = 7.616$, $p < .001$. A summary of the regression coefficients presented in Table 5 indicates that the predictor of WAIS-IV Vocabulary significantly contributed to the model ($\beta = .532$, $p < .001$). As performance on the Vocabulary subtest improved, performance on the Applying Decision Rules task also improved. None of the interactions significantly predicted performance on the Applying Decision Rules task.

Table 6. Regression Results for Applying Decision Rules

	B	β	t	part r
WAISVocab	.035	.535	6.182**	.502
Neuroticsm	-.001	-.075	-.685	-.056
Extraversion	.000	-.033	-.373	-.030
Openness	.001	.046	.524	.043
Agreeableness	-.001	-.084	-.969	-.079
Conscientious	-.001	-.047	-.464	-.038
WAISxNeuro	-.001	-.097	-.730	-.059
WAISxExtra	.001	.093	.975	.079
WAISxOpen	.000	-.075	-.749	-.060
WAISxAgree	-.001	-.129	-1.280	-.103
WAISxConsc	.000	.001	.010	.001

** Significant at .01 level
* Significant at .05 level

The results of the final simultaneous multiple regression using Vocabulary and the five personality factors to predict performance on the Consistency in Risk Perception task of the ADMC are presented in Table 7. Regression results indicate that the overall model approached conventional levels of significance, $R^2 = .102$, $R^2_{adj} = .052$, $F(6, 112) = 2.016$, $p = .070$. A summary of the regression coefficients presented in Table 6 indicates that the predictors of WAIS-IV Vocabulary ($\beta = .219$, $p = .027$) and Agreeableness ($\beta = -.200$, $p = .044$) significantly contributed to the model. As WAIS-IV Vocabulary performance improved, decision-making performance on this task also improved. Conversely, as the personality trait of Agreeableness increased, performance on this decision-making task suffered. None of the interactions significantly predicted performance on the Consistency in Risk Perception task.

Table 7. Regression Results for Consistency in Risk Perception

	B	β	t	part r
WAISVocab	.009	.219	2.248*	.207
Neuroticsm	-.001	-.160	-1.294	-.119

Table 7. Cont.

	B	β	t	part r
Extraversion	.000	.018	.178	.016
Openness	-.001	-.157	-1.591	-.146
Agreeableness	-.002	-.200	-2.036*	-.187
Conscientious	.000	-.058	-.501	-.046
WAISxNeuro	-.001	-.240	-1.574	-.146
WAISxExtra	.000	-.027	-.252	-.023
WAISxOpen	.000	.047	.405	.037
WAISxAgree	-.001	-.153	-1.321	-.122
WAISxConsc	.000	-.108	-.845	-.078

** Significant at .01 level
* Significant at .05 level

CHAPTER IV

DISCUSSION

Results of the multiple regression analyses indicate that personality traits as measured by the NEO-PI-3 were not significant predictors of the IGT, BART, or the Applying Decision Rules task of the ADMC. However, the results indicate that the personality trait of Agreeableness is a significant predictor of performance on the Resistance to Framing and Consistency in Risk Perception tasks of the ADMC. The strongest predictor across decision-making tasks appears to be verbal ability as measured by the Vocabulary subtest of the WAIS-IV. It was found to be a significant predictor of performance on all three ADMC tasks. Only one interaction effect was found to be significant. The interaction of Openness to Experience and WAIS-IV Vocabulary significantly predicted variance in performance on the BART in such a way that at lower levels of verbal ability increased Openness to Experience predicted better performance on the BART.

The predictive power of the WAIS-IV Vocabulary subtest for each of ADMC tasks supports the role of cognitive ability in decision-making competence. The Vocabulary subtest accounted for 8%, 25%, and 4% of the variance in decision-making performance on the Resistance to Framing, Applying Decision Rules, and Consistency in Risk Perception tasks, respectively. This was the most variance accounted for by any predictor in the respective regression analyses.

This finding is not surprising given the prior research. Reasoning abilities, which strongly reflect the basic skills of accuracy and consistency in assessing beliefs and values, integrating information, and monitoring cognition necessary for decision-making, have been found to be related to individual differences in cognitive ability as measured by SAT score, performance on Raven's Matrices, and reading comprehension tests (Stanovich & West, 1998). Parker and Fischhoff (2005) found measures of resistance to framing and applying decision rules to be significantly correlated with measures of both verbal ability and non-verbal ability as measured by subtests of the WISC-R (i.e. vocabulary, block design, picture arrangement, and object assembly). The researchers also found an overall measure of decision-making competence, which included the three paper-and-pencil tasks used in the current research, to be significantly correlated with the verbal and non-verbal measures of cognitive ability. Similarly, in the validation process of the ADMC, better performance on each task was related to higher levels of cognitive ability (Bruine de Bruin et al., 2007).

The significant prediction of decision-making tasks by Agreeableness is congruent with some prior research, but it has not been found to be a consistently strong predictor of decision-making. Levin at al. (2002) found Agreeableness and Conscientiousness to significantly account for variability in both an attribute framing effect (i.e. evaluating 80% lean versus 20% fat ground beef), in which higher Agreeableness was related to increased salience of the effect (e.g. more positive evaluation in the positive frame, which indicates poorer decision-making), and a risky-choice framing effect (e.g. choosing between programs A and B in both a positive and negative frame regarding proportions of people who will or will not reduce their

cholesteral), in which highly Agreeable individuals do not show a preference for taking risk in a negative frame compared to a positive frame. Low Agreeableness, as measured by The Big Five Inventory, has also been found to be related to inconsistency in risk preference (Soane & Chmiel, 2005). These prior findings are consistent with the current findings in which Agreeableness was related to poorer performance on Resistance to Framing and Consistency in Risk Perception tasks. Perhaps highly agreeable individuals tend to place more emphasis on positive information, which makes them unable to adequately assess risks and probabilities.

Given prior research, the absence of predictive power for some of the personality traits was surprising. High scores in Neuroticism, Openness to Experience, and Conscientiousness have been found to predict greater inconsistency in risk perception (Soane & Chmiel, 2005). In the current research, only Agreeableness predicted performance on Consistency in Risk Perception with highly agreeable individuals being more inconsistent. Openness to Experience has also been found to be related to greater susceptibility to anchoring effects (McElroy & Dowd, 2007). One would have expected this influence to have negatively impacted performance on decision-making tasks, especially Resistance to Framing and Consistency in Risk Perception which rely heavily on the individual's initial perception of the events. However, in the current research, Openness to Experience did not significantly predict decision-making performance on any of the five tasks.

Lauriola and Levin (2001) found both Neuroticism and Openness to Experience, as measured by a short adjective checklist, to be significant predictors of risk taking to achieve a gain. One would have expected those low in Neuroticism or high in Openness

to Experience to show better performance on the BART, in which better performance indicates a willingness to take risks (i.e. more pumps) to achieve a gain (i.e. more money). Conversely, Lauriola and Levin (2001) also found high Neuroticism to predict greater risk-taking to avoid a loss. Similarly, Lauriola, Russo, Lucidi, Violani, and Levin (2005) found negative affective traits (e.g. neuroticism) to significantly predict risk-seeking in a negatively framed scenario.

This differential prediction of risk-taking would indicate that Neuroticism plays a role in resistance to framing in that the frame of the information (positive or negative) impacts the decision-making (risk-taking). However, Neuroticism was not a significant predictor of any of the five decision-making tasks in the current research. One explanation of these discrepant findings may be in the personality measure used in the current study. The NEO-PI-3 is a more reliable and valid measure of the Big Five personality traits than the adjective checklist used by Lauriola and Levin (2001). It may also be that previous research used insufficient decision-making tasks. For example, Lauriola and Levin (2001) and Lauriola et al. (2005) used forced choice tasks in which the participants had to choose between a certain/safe option and a risky option. This may not allow for nuanced measurement of the degree of risk an individual is willing to take. Rating preferences on a continuum, which is the response method of the Resistance to Framing task, may allow for greater understanding of the relationship between personality traits and the degree of risk an individual is willing to take given a specific scenario.

Another unexpected, but interesting finding, was the prediction of BART performance by the interaction of Openness to Experience and WAIS-IV Vocabulary. As

noted in the previous paragraphs, prior research found Openness to Experience to predict risk taking to achieve a gain (Lauriola & Levin, 2001). This is consistent with the current finding that higher levels of Openness to Experience were related to better BART performance (e.g. more risk taking to achieve a gain), but this was only true for those with a low level of verbal ability. Perhaps personality traits moderate the relationship between decision-making skill and cognitive ability for certain types of decision-making. In this instance, high Openness to Experience, which has components of intellectual curiosity and willingness to reexamine values (McCrae & Costa, 2010), may aid in better decision-making for those who are less cognitively able.

The previously described interaction effect may also help explain the dichotomy of "hot" affective decision-making, which involves relying on emotional responses, and "cold" cognitive decision-making, which involves relying on rational determination of risks and benefits. It is believed that "hot" decision-making assists "cold" decision-making by unconsciously biasing the individual's response toward that consistent with the emotional state brought forth by the decision context. Studies using the IGT and measures of skin conductance indicate that the IGT may incorporate aspects of "hot" decision-making (Buelow & Suhr, 2009).

Individuals who are low in cognitive ability, which has been found to be significantly correlated with decision-making (e.g. Stanovich & West, 1998; Parker & Fischhoff, 2005; Bruine de Bruin et al., 2007), may perform better on tasks of "hot" decision-making such as the IGT and the BART and worse on tasks of "cold" decision-making such as Applying Decision Rules. Personality may moderate this relationship depending on the relative emotional or cognitive component of the trait. For example,

highly neurotic individuals may rely on "hot" decision-making, which may produce better or worse performance depending on the task. Alternatively, highly conscientious individuals may rely on "cold" decision-making and suppress "hot" decision-making processes, which may also produce better or worse performance depending on the task.

Unfortunately, the correlational data from the current research does not necessarily support a strict dichotomy between supposedly "cold" and "hot" decision-making tasks. The IGT and the BART were not significantly related, although the IGT was significantly correlated with all three ADMC measures and the BART was correlated with the Applying Decision Rules task. It is more likely that the current measures of decision-making include aspects of both processes. This equivalence of "hot" and "cold" processes in the IGT has also been proposed (Brand et al., 2007, as cited by Buelow & Suhr, 2009).

A limitation of the current research is the small sample size drawn from a homogenous population of undergraduate students at a Midwestern university. The power analysis designated a need for 123 participants to detect a moderate effect at a power of .80. Post hoc power analysis indicated poor power to detect the effect for the IGT (power = .34), BART (power = .28), and the Consistency in Risk Perception task (power = .61), but adequate power to detect the effect for the Resistance to Framing task (power = .95) and the Applying Decision Rules task (power = .99). For some of these measures, a larger sample size may have contributed to detection of the effect. However, it is unlikely that even the recommended sample size of 123 would have been sufficient to detect the effects of either the IGT or the BART given their very poor post-hoc power values.

The sample was also taken from a homogeneous sample based on age and location. The mean age of participants was 20, thus the results of this study apply primarily to college-aged adults. Similarly, the participants were all taken from a relatively small Midwestern university located in a small Midwestern city. It is possible that similar results would not be found with a more diverse sample. Prior research has indicated differential performance on decision-making tasks related to age. For example, younger adults performed better than older adults on resistance to framing and applying decision rule tasks, while older adults performed better on recognition of social norms and resistance to sunk costs tasks (Bruine de Bruin et al., 2007). Future research may benefit from obtaining a sample with a wider age range or comparing predictors according to age group.

A potential limitation of the current study is the use of only one measure of cognitive ability. Considering the predictive power of the Vocabulary subtest of the WAIS-IV, future research may incorporate more measures of cognitive ability to best ascertain the predictive power of this individual variable on decision-making skill or to control for this variable in the investigation of other variables (i.e. personality). Using eight tests of cognitive ability (i.e. immediate memory, delayed memory, recognition memory, digit span, simple reaction time, choice reaction time, digit-symbol, and Stroop), Henninger et al. (2010) compared the performance of younger and older adults on the IGT and the BART. After accounting for the effects of cognitive ability, no age related differences in decision-making performance were evident. More specifically, the eight cognitive ability measures were factor analyzed into processing speed and memory. These two components differentially predicted decision-making performance on the

BART and the IGT, with greater processing speed linked to better choices on the BART and greater memory performance linked to greater decision quality on the IGT. More precise measures of cognitive ability, such as those used by Henninger et al. (2010), may allow for more nuanced understanding of the contribution of cognitive ability to decision quality across decision-making tasks.

Future research in the area of decision-making may continue to use multiple decision-making measures in order to address the various skills required for adequate decision-making. It would appear that the current measurement of decision-making is fragmented as evidenced by the inconsistent findings among the five decision-making measures in the current research. While it may be difficult to develop a measure of overall decision-making skill, an effort to create a measurement that combines the various decision-making skills into a more cohesive and consistent framework may be warranted. Factor analytic methods may be used to derive basic decision-making skills from the existing measures. Bruine de Bruin et al. (2007) attempted to create an overall measure of decision-making, the ADMC, but this measure may be missing some of the emotional or "hot" decision-making processes discussed previously as it is highly correlated with cognitive ability.

Development of cohesive decision-making measures would help improve the study of decision-making as it relates to particular real-world situations such as career decision-making, medical decision-making, mental illness, and health-related behaviors. For example, Bruine de Bruin et al. (2007), in the validation process of the ADMC, found that overall ADMC performance was associated with self-reported real world decision outcomes after controlling for cognitive ability. Better ADMC performance was

consistent with experiencing fewer negative outcomes (e.g. spending a night in jail, throwing out groceries) due to poor decisions.

The ecological validity of decision-making research may be improved by considering decision domain. Soane and Chmiel (2005) found differential prediction of risk preference from personality traits across domains. For example, Conscientiousness significantly predicted risk preference in work, finance, and health domains, but Extraversion and Openness to Experience were only predictors of risk preference in the work domain. Similarly, Agreeableness was most relevant in predicting risk preference in the finance domain. It may be that the context of the decision moderates the predictive power of the personality trait on the decision outcome. For example, highly agreeable individuals may make better decisions in social domains while highly open individuals may make better decisions in the career domain. According to previous research, it would appear that Conscientiousness is important in many areas, which is consistent with characteristics of Conscientiousness including deliberateness, competence, and self-discipline (McCrae & Costa, 2010).

While the current research did not have adequate statistical power to conduct additional analyses, future research may benefit from measuring more nuanced personality traits. Analysis of the facet scales of the NEO-PI-3 may yield valuable information as to the specific personality traits that predict decision-making skill. For example, low impulsiveness, which is one facet of Neuroticism, has been related to poor performance on the BART indicating unwillingness to take risks to achieve a gain (Bornovalova et al., 2009). However, low Neuroticism, which may include low impulsiveness, has been found to be related to a tendency to take risk to achieve a gain,

which would correspond to better BART performance (Lauriola & Levin, 2001). Anxiety, another facet of Neuroticism, has been found to be an important predictor of decision-making across multiple studies (e.g. Bensi et al., 2010; Maner et al., 2007; Miu et al., 2008). Investigation of this facet of Neuroticism may yield more nuanced understanding of the relationships between personality and decision-making.

A similar case may be made for Conscientiousness. Perfectionism, which may be considered a combination of the order and achievement-striving facets of Conscientiousness has been found to be related to performance on a decision-making task in which the subjects were aware of relative gains and losses (compared to the IGT in which they are not aware of the gains and losses prior to their decision; Brand & Altstotter-Gleich, 2008). Perhaps these facets of Conscientiousness predict performance on specific tasks, but the overall trait is not specific to the nuances of decision-making performance.

The current research sought to determine the relationship between personality and decision-making. Prior research had failed to use the NEO-PI-3, the most valid and reliable measure of the Big Five personality traits. Despite the abundance of decision-making measures, prior research had failed to compare the relationships between personality traits and decision-making across decision-making tasks. Results were both consistent and inconsistent with prior research. Future research may benefit from more cohesive decision-making measures, more nuanced measures of personality, and the inclusion of measures of cognitive ability.

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