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PROBABILITY DISCOUNTING OF THE QUALITY OF SEXUAL RELATIONSHIPS

by

Aimee C. Howard

B.S., Western Michigan University, 2008

A Thesis

Submitted in Partial Fulfillment of the Requirements for the
Masters of Science Degree.

Department of Behavior Analysis and Therapy
in the Graduate School
Southern Illinois University Carbondale
May 2014

THESIS APPROVAL
PROBABILITY DISCOUNTING OF THE QUALITY OF SEXUAL RELATIONSHIPS

By
Aimee Howard

A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of
Master of Science Degree
in the field of Behavior Analysis and Therapy

Approved by:

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Graduate School
Southern Illinois University Carbondale
March 31, 2014

AN ABSTRACT OF THE THESIS OF

Aimee Howard, for the Masters of Science degree in Behavior Analysis and Therapy, presented on March 31, 2014, at Southern Illinois University Carbondale.

TITLE: PROBABILITY DISCOUNTING OF THE QUALITY OF SEXUAL RELATIONSHIPS

MAJOR PROFESSOR: Dr. Mark Dixon

The responses from a probability discounting procedure was collected to make between and within-group comparisons of the quality of sex with different sexual partners and monetary rewards between individuals who have engaged in infidelity in the past and individuals who have never engaged in infidelity in the past. A modification to the quality of the overall relationship was introduced to identify whether discounting outcomes could be altered. Gender differences were also examined. Results showed a significant difference between groups when discounting the quality of sex of differing sexual partners but no difference between groups with monetary rewards. There was also a significant difference between commodity types within the group that have never engaged in infidelity but no difference between commodity type within the group that has engaged in infidelity in the past. The modification of the quality of the overall relationship resulted in no significant difference in responses to the probability discounting trials and there were no significant gender.

DEDICATION

This work is dedicated to my daughter, Elizabeth Mae Boswell, whose life has brought a heavy purpose to everything I do and my mother, Lisa Sue Howard, whose consistent encouragement and support made me believe I could be the first person in my family to attend college and exceed those dreams by attending graduate school.

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CHAPTER 1

INTRODUCTION

Infidelity

Infidelity and rules related to infidelity can be traced back to religious texts (e.g. the Bible and Qur'an). According to the Bible, God provided the Ten Commandments, which are a set of are rules to follow throughout an individual's life. One of these rules indicated individuals should not engage in adultery; which is specifically, sexual relations with a non-significant other while married (Exodus 20:14 New International Version). The Bible continues to designate other behaviors related to sexual infidelity as unacceptable by stating that even viewing another woman lustfully will lead an individual to commit adultery (Matthew 5:28). These rules have continued to the present time; however, rule-governed consequences of engaging in infidelity have evolved.

During the time of the colonies, consequences of infidelity were enforced by society in the form of whipping or public disfigurement due to the religious beliefs of the early settlers (Johnson, 1970). During the present time, there are some areas within the United States that have laws against engaging in infidelity. Idaho, Massachusetts, and Michigan (the state in which this study recruited participants) are among these states that currently have laws against adultery; which, are punishable by imprisonment and/or a monetary fine (Idaho Code Ann.; Mass. Gen. Laws; Mich. Penal Code, 1931). These laws are rarely enforced, and the rule-governed consequences of infidelity are less of a societal nature and more of a personal relationships nature. For example, the relationships of friends, relatives, significant other, and any children of the individual who committed infidelity may be influenced in a negative way.

The behaviors that are encompassed under the definition of infidelity have also evolved with time. Currently, in the United States, infidelity behaviors include but are not limited to: sexual intercourse, flirting, lying, withholding information, oral sex, and fantasizing while married or in a monogamous dating relationship (Wilson, Mattingly, Clark, Weidler, & Bequette, 2011). Some of these behaviors (e.g. flirting and fantasizing) may be acceptable within a monogamous relationship depending on the views of the individuals within the relationship. For example, 80% of a sample of college students indicated that attending a movie or spending the evening with a non-significant other of the opposite sex was acceptable and the other 20% of this sample indicated these activities as unacceptable (Weis & Slosnerick, 1981). When limiting infidelity behavior to extra-relational sexual intercourse, the majority of the population views infidelity as an unacceptable behavior (Treas & Giesen, 2000; Weis & Slosnerick, 1981; Wilson et al., 2011).

A large majority of married and cohabiting couples, 99% and 94% respectively, in the United States, expect their significant other to be sexually exclusive and make the assumption that their significant other expects the same exclusiveness (Treas & Giesen, 2000). However, self-reported rates of infidelity do not match these expectations of sexual exclusiveness. The current estimates regarding rates of infidelity are between 11% and 23% for the duration of a current relationship and 2% to 5% for the past 12 months (Chandra, Mosher, Copen, & Sionean, 2011; Hall, Fals-Stewart, & Fincham, 2008; Mark, Janssen, & Milhausen, 2011; Treas & Giesen, 2000; Whisman, Gordon, & Chatav, 2007). This overlap in statistics suggests the majority of individuals

who engage in infidelity do so while aware they are breaching the rule to be sexually exclusive.

Infidelity Antecedent Variables

Verbal humans generate rules in relation to schedules of reinforcement and these rules regulate behavior (Hayes, Barnes-Holmes, & Roche, 2001). It has been shown in previous research that when verbal humans are given either accurate or inaccurate instructions, the behaviors may follow the instructions despite the reinforcement contingencies they come into contact with (Dixon, Hayes, & Aban, 2000; Hayes, Brownstein, Haas, & Greenway, 1986). Most individuals, who are in a monogamous relationship, behave according to the rule that sexual exclusiveness is one of the expectations in a monogamous relationship (Treas & Giesen, 2000). These same individuals may derive relations between rules and contexts or have a resurgence of verbal relations they have heard in the past (Hayes et al., 2001) that influence their choice to maintain that sexual exclusivity rule. For example, when an individual initially commits to a monogamous relationship, they may relate that relationship to words such as good, fun, love, and other positive stimuli. Once the relationship is no longer new and exciting, and the quality of sex within the relationship is decreasing, that same individual may relate the relationship, in this state, to words such as bad, boring, and loath.

Previous research has shown individuals who rated the quality of sex within their relationship as low, also indicated a decrease in relationship quality after a period of time had passed following that rating (Byers, 2005). If this is the case, the rules the individual has heard in the past related to relationships in this state may become dominate over the rules that you must remain monogamous. The individual may have a

resurgence of rules such as: 'I need to make myself happy', as well as, rules about what a relationship should be like. The ability to make choices in relation to rules includes the relational network of perspective-taking (Hayes et al., 2001). Perspective-taking is an abstract relation taught through presentation of multiple exemplars and demonstrations during everyday life (Hayes et al., 2001). It is an abstract form of relational frame because the relations are not defined by formal properties; they are formed by continuous use of abstracted terms such as: I-YOU, HERE-THERE, and NOW-THEN (Hayes et al., 2001). All of these perspective-taking relations are constantly changing dependent on the person, place, and time; therefore, no formal properties are consistent with the description of these terms.

Researchers have identified several contextual factors that increase the probability that an individual in a monogamous relationship will engage in infidelity. Relationship quality is the most common factor related to infidelity (Buss & Shackelford, 1997; Drigotas, Safstrom, & Gentilia, 1999; Mark et al., 2011; Treas & Geisen, 2000; Whisman et al., 2007). Quality of sex (Buss & Shackelford, 1997; Whisman et al., 2007), personality factors (e.g. neuroticism) that are indicative of impulsivity (Buss & Shackelford, 1997; Treas & Geisen, 2000, Whisman et al., 2007), and quality of alternatives (Drigotas et al., 1999; Treas & Geisen, 2000) are also factors that are commonly related to risk of engaging in infidelity. Religion has been identified as a factor (Buss & Shackelford, 1997; Treas & Geisen, 2000; Whisman et al., 2007); however, unlike the other identified factors, religion has also been shown to have no effect on the probability of engaging in infidelity (Mark et al., 2011). Interestingly, gender is not considered a factor. When controlling for the other variables (e.g. interest in sex

and values) and taking into account the differences of social consequences related to discussing infidelity, there is not a significant difference in the rates of infidelity between females and males (Chandra et al., 2011; Mark et al., 2011; Treas & Giesen, 2000).

Effects of Infidelity

Divorce or the dissolution of a relationship is one risk factor when choosing to engage in infidelity. In a cross-cultural sample of 186 societies, from the regions of North America, South America, East Eurasia, Circum-Mediterranean, Africa, and Insular Pacific, infidelity was the leading cause of divorce in 88 societies (Betzig, 1989). Infidelity within a relationship has been identified as one of the most damaging problems in a relationship (Whisman, Dixon, & Johnson, 1997). Divorce or dissolution of the relationship often follows an act of infidelity due to the negative effects associated with the discovery that a significant other has engaged in infidelity. These effects include but are not limited to: lose of trust, decrease in self-confidence, anger, fear of infidelity occurring again, and resentment (Solomon & Teagno, 2006).

Sexually transmitted infections are another risk factor when engaging in infidelity. The majority of individuals who engage in infidelity do not inform their significant other of those sexual encounters, and individuals who engage in sexual relations outside of the relationship do not consistently use condoms with either their significant other or their non-significant other to prevent the transmission of sexually transmitted infections (Hall et al., 2008). Thus, infidelity behavior puts the individual who engaged in the behavior and their significant other at risk for sexually transmitted infections. Johnson and Bruner (2012) further suggests that drug dependent individuals who have the option to engage

in sex with a preferred individual will choose to have sex without a condom immediately rather than wait for a condom to be available.

There were approximately 20 million new cases of sexually transmitted infections in the year 2008 and a total of 110 million individuals with a sexually transmitted infection in 2008 (Satterwhite et al., 2013). These estimates are limited to the eight most common sexually transmitted infections: HIV, hepatitis B virus, chlamydia, genital herpes simplex virus type 2, gonorrhea, trichomoniasis, syphilis, and human papillomavirus (Chesson, Blandford, Gift, Tao, & Irwin, 2004; Satterwhite et al., 2013). Young adults between the ages of 15 and 24 alone acquired approximately 9.1 million new cases of sexually transmitted infections in the year 2000 (Chesson et al., 2004).

There is some research that suggests adults are more likely to engage in infidelity when they are aware their parents have engaged in infidelity. Infidelity behaviors can be modeled to children of any age from the parent (Platt, Nalbone, Casanova, & Wetchler, 2008). Previous research has shown adult males who were aware of their father's infidelity behaviors were significantly more likely to engage in infidelity behaviors themselves when compared to adult males who were not aware of their father's infidelity behaviors (Platt et al., 2008).

The immediate consequences for engaging in infidelity include: self-reinforcement or self-punishment, reinforcement in the form of orgasm or attention, and punishment in the form of being caught engaging in infidelity; however, this is only a punishment contingency if the individual engaging in infidelity is caught immediately after the behavior. If the individual is not caught immediately after engaging in the

infidelity behavior, and the behavior is modified in the future as a result of being caught, the effect is considered rule-governed and not an actual consequence (Malott, 2008).

When you take into account all the possible factors that can increase or decrease the likelihood that an individual will engage in infidelity; the choice to engage in this behavior is complex. Infidelity occurs as a result of the combinations between stimuli in the present environment, the impulsivity or risk-taking associated with similar choices in the past, and network of verbal rules. One way to further examine the factors that influence the choice to engage in infidelity is the use of discounting procedures.

Discounting Tasks

Discounting is a frequently used procedure in research to identify the choice between smaller immediate (certain) outcomes and larger delayed (uncertain) outcomes (Shead & Hodgins, 2009). Impulsivity is defined as choosing a smaller immediate outcome over a larger delayed outcome and risk-taking is defined as choosing an outcome that is uncertain over an outcome that is certain (Shead & Hodgins, 2009). There are two general types of discounting procedures used in research: delay discounting and probability discounting.

Delay Discounting

Delay discounting measures an individual's level of impulsivity when choosing between two outcomes; a smaller immediate outcome or a larger delayed outcome (Critchfield & Kollins, 2001). Typically the immediate outcome amount is varied across each delay amount to identify the indifference point, in which, the value of the smaller immediate outcome becomes equivalent to the larger delayed outcome (Critchfield & Kollins, 2001). The rate of discounting is the rate at which the value of the outcome

decreases by delay (Green & Myerson, 1996). A higher rate of discounting (steeper discounting) is equivalent to making choices that are impulsive. A lower rate of discounting is equivalent to making choices that are not impulsive. The rate of discounting and indifference points may be affected by the procedures used during the delay discounting task.

One procedural difference is referred to as the magnitude effect. The maximum magnitude of the large delayed reward increases or decreases the rate of discounting based on the magnitude of that reward (Myerson, Green, Hanson, Holt, & Estle, 2003). According to the magnitude effect, delay discounting results in a higher rate of discounting when the delayed outcome is of smaller value and lower rate of discounting when the delayed outcome is of larger value (Green & Myerson, 2004; Myerson et al., 2003). For example, if the delayed reward is \$1,000 the rate of discounting will be steeper than the rate of discounting for a delayed reward of \$10 when utilizing the same delay discounting procedure for both monetary amounts. Another procedural difference is called the domain effect. The type of commodity that is used during the delay discounting task can either decrease or increase the rate of discounting. Past research has shown that when the commodity is a consumable reinforcer (e.g. food, alcohol, drugs, cigarettes) there is a higher discounting rate (steeper discounting) than when the commodity is a generalized conditioned reinforcer (e.g. money) (Odum & Rainaud, 2003). These procedural differences (magnitude and domain effects) indicate that researchers should use the commodity and the magnitude in their delay discounting procedure that is representative of the real life choice they are attempting to replicate. If

they use a different type of commodity or a different magnitude of the commodity it may affect the discounting rate and show inaccurate results.

Previous research has shown that state-based factors such as: experience (Green, Fry, & Myerson, 1994; Logue & Anderson, 2001; Whelan & McHugh, 2009), context (Dixon, Jacobs, & Sanders, 2006), outcome types (Estle, Green, Myerson, & Holt, 2007; Ramussen, Lawyer, & Reilly, 2010; Xu, Korczykowski, Zhu, & Hengyi, 2013), and magnitude of outcomes (Green & Myerson, 2004; Myerson et al., 2003) influence rate of discounting during the delay discounting task. State-based factors are short term variables that influence behavior over a short period of time (Odum, 2011). Trait-based factors are long term stable characteristics (e.g. personality) that influence behavior throughout life (Odum, 2011).

Previous research that has shown trait-based factors influence rate of discounting include: the stability of individual discounting rates over time (Green et al., 1994; Kirby, 2009; Yoon et al., 2007), and the discounting rates of cigarette smokers compared to ex-smokers (Bickel, Odum, & Madden, 1999; Yoon et al., 2007). A more parsimonious and behavioral explanation for the stability of individual discounting rates over time may be that individual discounting rates are simply a reflection of that individuals experience of reinforcement over time in relation to impulsive choices (Green & Myerson, 2004). The tendency for an individual to make an impulsive choice would then be based upon a history of learning; which, can be modified by state variables.

The data obtained from delay discounting tasks are often described using mathematical equations. The hyperbolic discounting model and the area under the curve (AUC) are the most common mathematical equations used in delay discounting

research (Green & Myerson, 2004; Myerson, Green, & Warusawitharana, 2001). The hyperbolic discounting model is equivalent to the equation $V = A / (1+kD)$, where V is the subjective value of A , k is the parameter that determines the rate of discounting, and D is the delay in units of time (Green & Myerson, 1996). The hyperbolic model is commonly used because it assumes the subjective value is dependent on the ratio of the value of time, (Green & Myerson, 1996) it accurately predicts the rate of discounting at the individual and group level (Rachlin, Raineri, & Cross, 1991), and better explains the variance at the individual and group level (Green & Myerson, 1996). The higher rate of discounting is expressed by a lower V value.

The AUC is equivalent to the equation $\text{SUM} \{(x_2-x_1)[(y_1+y_2)/2]\}$, where x is the subjective delay, and y is the subjective value of the indifference points (Myerson et al., 2001). The AUC is commonly used because it is theoretically neutral, and it allows the use of parametric tests (Myerson et al., 2001). Thus, none of the participant's data will need to be thrown out because it does not fit the theoretical equation. An AUC value of 0 is equivalent to the highest rate of discounting, and a value of 1 is equivalent to no discounting. Lane, Cherek, Pietras, and Tcheremissine (2003) investigated the relationship of the AUC with the k parameter of the hyperbolic equation and found them to be highly negatively correlated. This means that both the AUC and the hyperbolic equation are a reliable measure for calculating the rate of discounting.

Probability Discounting

Probability discounting measures an individual's level of risk-taking when choosing between two outcomes: a smaller certain outcome and a larger uncertain outcome (Shead & Hodgins, 2009). Typically the smaller certain outcome is varied

across each probability amount to identify an indifference point, in which the value of the smaller certain outcome becomes equivalent to the larger uncertain outcome (Shead & Hodgins, 2009). During the probability discounting task, the rate of discounting is the rate at which the value of the reward decreases by the probability of receiving the outcome (Green & Myerson, 1996). A higher rate of discounting is equivalent to making choices that are risky. A lower rate of discounting is equivalent to making choices that are risk-averse. The rate of discounting and indifference points may be affected by the procedures used during the probability discounting task.

Similar to the delay discounting task, the probability discounting task is also affected by the magnitude effect; however, the effect is in the opposite direction. Probability discounting results in a lower rate of discounting when the maximum outcome is of lesser value and a higher rate of discounting when the maximum outcome is of larger value (Green & Myerson, 2004; Myerson et al., 2003). For example, if the uncertain reward is \$1000 the rate of discounting will be higher than an uncertain reward of \$10 when utilizing the same probability discounting procedure for both monetary amounts. Also, in contrast to the delay discounting task, the probability discounting task has been shown to be unaffected by commodity type (Estle et al., 2007). These procedural effects (or lack of effects) indicate that researchers should use the actual magnitude of the outcome in their probability discounting procedure that is representative of the real life choice they are attempting to replicate. More research is needed to determine whether the domain effect reliably does not take into consideration the domain of the commodity.

Probability discounting has been successfully used to examine the degree of discounting for a variety of commodities, including: food (Ramussen et al., 2010), alcohol consumption (Bidwell et al., 2013; Richards, Zhang, Mitchell, & De Witt, 1999), tetrahydrocannabinol (THC) consumption (McDonald, Schleifer, Richards, & De Witt, 2003), nicotine consumption (Lawyer, Schoepflin, Green, & Jenks, 2011), monetary outcomes (Green & Myerson, 2004), and sexual behaviors (Lawyer, 2008; Lawyer & Schoepflin, 2013; Lawyer, Williams, Prihodova, Rollins, & Lester, 2010).

The only state-based factors that have been researched using probability discounting include: magnitude of outcomes (Myerson et al., 2003), and outcome type (Estle et al., 2007). The magnitude of the outcome does have an effect of rate of discounting (Myerson et al., 2003); however, outcome type has been shown to have no effect on discounting rate (Estle et al., 2007). Trait-based variables have not yet been researched while utilizing a probability discounting task.

Similar to the data from the delay discounting task, the data from the probability discounting tasks are described by the same mathematical equations (hyperbolic discounting model and AUC) for the same reasons that it describes the delay discounting data (Green & Myerson, 2004; Myerson et al., 2001). There is a difference within the equation itself when using the hyperbolic model for probability discounting data. In the equation $V = A / (1 + kD)$ for the hyperbolic model; instead of the variable D representing the delay in units it represents the odds against receiving the reward (Rachlin et al., 1991). There is also a difference within the AUC equation when calculating the AUC of probability discounting data. In the equation $SUM \{(x_2 -$

$x_1[(y_1+y_2)/2]$ for the AUC; instead of the variable x representing delay amounts, they represent probability amounts (Myerson et al., 2001).

Use of Monetary Outcomes in Discounting

The most common outcome used for both delay and probability discounting tasks is monetary outcomes. Money is a generalized conditioned reinforcer in which the reinforcing value is independent of states of deprivation and satiation; hence, is it always reinforcing (Cooper, Heron, & Howard, 2007). Monetary amounts are commonly used in research to compare the discounting rates of different populations (Bickel et al., 1999; Green et al., 1994; Heery, Robinson, McMahon, & Gold, 2007; Johnson & Bruner, 2012) and as the control outcome in which the discounting rate of other outcomes is compared (Estle et al., 2007; Johnson & Bruner, 2012; Lawyer, 2008; Lawyer & Schoepflin, 2013; Lawyer et al., 2010; Odum & Rainaud, 2003; Rasmussen et al., 2010).

Hypothetical versus Real Discounting Outcomes

Monetary outcomes are also commonly used to determine whether using hypothetical outcomes instead of real outcomes have an effect on rates of discounting. A vast spectrum of research articles have examined the effects of using hypothetical outcomes instead of real outcomes. These studies found no difference between using real or hypothetical outcomes when utilizing the discounting task with adults (Johnson & Bickel, 2002) college student (Dixon, Mui Ker Lik, Green, & Myerson, 2013; Lagorio & Madden, 2005; Madden, Begotka, Raiff, & Kastern, 2003; Madden et al., 2004) and substance-abusing participants (Lawyer et al., 2011). No differences between real and hypothetical outcome type on rate of discounting was found when using a variety of

procedures, including: using the probability discounting task (Hinvest & Anderson, 2010; Lawyer et al., 2011) using the delay discounting task (Dixon et al., 2013; Johnson & Bickel, 2002; Madden et al., 2003) utilizing larger outcome amounts (Johnson & Bickel, 2002), utilizing smaller outcome amounts (Madden et al., 2003), conducting an analysis of between and within-subject comparisons (Madden et al., 2004) utilizing different sets of monetary outcome amounts and delay amounts for each condition (Madden et al., 2004), requiring the participants to spend the monetary amounts earned on consumable items (Lagorio & Madden, 2005), delivering the outcome amount for each choice in the real money condition (Dixon et al., 2013; Lagorio & Madden, 2005) and ensuring rate of reinforcement and session length were equal for both conditions (Dixon et al., 2013). When examining the effect of counterbalancing condition order, results have been contradictory depending on the research study. Some researchers found there was no difference when counterbalancing condition order (Johnson & Bickel, 2002; Madden et al., 2003). Other researchers have found a carry-over affect may be present when participants complete the real outcome discounting task before the hypothetical outcome discounting task (Hinvest & Anderson, 2010; Lawyer et al., 2011).

Sexual Outcomes in Discounting

Several studies have examined sexual outcomes using delay and probability discounting tasks. These studies have found both the probability and delay discounting tasks were able to identify patterns of choice for sexual outcomes (Lawyer et al., 2010), the probability discounting task provided less variable data for sexual outcomes than the delay discounting task (Lawyer, 2008), money and sexual outcome discounting rates were significantly correlated for both probability and delay discounting tasks (Lawyer &

Schoepflin, 2013), and individuals with higher rates of discounting for sexual outcomes were at greater sexual risk on a self-report measure (Johnson & Bruner, 2012).

Substance abusers discounted sexual outcomes at a significantly higher rate when compared to non-substance abusers (Jarmolowicz, Bickel, & Gatchalian, 2013). There were no consistent differences in gender while discounting sexual outcomes (Johnson & Bruner, 2013; Lawyer & Schoepflin, 2013). Also, the test re-test reliability of discounting sexual outcomes is positively significantly correlated (Johnson & Bruner, 2013).

In summary, the previous sexual outcome studies (Jarmolowicz et al., 2013; Johnson & Bruner, 2012; Johnson & Bruner, 2013; Lawyer, 2008; Lawyer & Schoepflin, 2013; Lawyer et al., 2010) showed the data for discounting sexual outcomes were more systematic than not and the systematic responses fit the hyperbolic equation or a modified version of this equation; which is consistently used to examine discounting data. The results of each study also showed a possible domain effect between sexual outcomes and monetary outcomes when the delay discounting task was used. This suggests that using the delay discounting task to compare the discounting rates of sexual outcomes and monetary outcomes contain the extraneous variable of domain effects; which could possibly be controlled for by using a probability discounting task since previous research has shown the probability discounting task is not affected by outcomes of different domains (Estle et al., 2007). What these studies did not investigate is whether infidelity behavior can be measured using the discounting procedure.

Purpose

This study examines whether individuals who have engaged in infidelity discount the quality of sex differently than individuals who have never engaged in infidelity in the past by utilizing a probability discounting procedure to assess choices about sexual partners. For the purpose of this paper, infidelity was limited to extra-relational sexual intercourse and defined as sexual intercourse with a non-significant other while in a monogamous relationship. Use of a probability discounting task to examine infidelity choices allows analysis of the effects of the probability of getting caught and the quality of sex on the choice to engage in infidelity. This study further investigates whether overall quality of the relationship is correlated with discounting rates and whether the discounting rates can be modified by an alteration of the overall quality of the relationship using a THEN-NOW relational frame. Gender differences between individuals who have engaged in infidelity in the past, perceived overall quality of the relationship, and discounting outcomes were also examined.

CHAPTER 2

METHOD

Participants

Participants were recruited from the community using flyers and word of mouth. All participants (n=44) were at least 18 years of age, had at least one sexual relationship that involved voluntary sexual intercourse, and had engaged in sexual intercourse with either their significant other or a non-significant within the past three months. There were 22 females and 22 males within this sample. Twenty eight (89%) were Caucasian, 2 (5%) were African American, 1 (2%) was Asian, and 4 (9%) were Hispanic. Participants ages ranged from 18 to 63 (mean age = 34) years old. All participants received the opportunity for a reward in the form of a raffle for a 50 dollar gift card that occurred once all participants' data had been collected.

Setting and Materials

A computer-based program (Microsoft Power Point) was utilized to conduct the study. The researcher presented the Power Point and guided the participants through the hypothetical questions. The study was conducted with individual community members at the local library, the mall, or at the participants' home; in the most private area possible. Only the researcher and the participant were present during each session. All participants' received two questionnaires and three data sheets in which they selected their choices from the probability discounting tasks.

Procedures

The study consisted of two questionnaires and three conditions. After the participant provided consent to participate, the researcher presented written instructions

for the research study on the Power Point presentation (see Appendix A). After reviewing the instructions, each participant completed a demographics questionnaire (Appendix B) and a relationship quality questionnaire (Appendix C). After the participants completed the questionnaires, the researcher presented and reviewed two definitions. The perceived overall quality of the relationship was defined as the apparent value of all interactions and characteristics of your relationship with another person; that you find relevant to what a relationship should be like in your opinion. The perceived quality of sexual relationship was defined as sexual quality means different things for different people, you should answer the questions in terms of whatever kind of sexual activity (sexual quality) you find very appealing; which, was adapted from the definition of sexual activity in the study by Lawyer (2008). Within the three conditions there were an overall total of 382 trials. Completion of the study took approximately 30 minutes to one hour for each participant.

Condition A

During the first condition the participants completed a sexual outcomes probability discounting task. The participant made hypothetical choices between a decreasing amount of quality of sex with their significant other and a consistent 100% quality of sex with a non-significant other; with a decreasing probability of getting caught. The decreasing percentage of quality of sex with a significant other (100, 96, 92, 85, 80, 75, 70, 65, 60, 55, 50, 45, 40, 35, 30, 25, 20, 15, 10, 8, 5, and 1) were modified from monetary values used in the delay discounting task by Dixon, Marley, and Jacobs (2003). The probabilities of getting caught engaging in infidelity (100, 90, 75, 50, and 25) were replicated from Lawyer (2008). The first trial presented a choice between

100% quality of sex with a significant other and 100% quality of sex with a non-significant other, with 100% probability of getting caught. The next trial presented a choice between 96% quality of sex with a significant other and 100% quality of sex with a non-significant other; with 100% probability of getting caught. The percentage of quality of sex with the significant other continued to decrease until the choice between 1% quality of sex with a significant other and 100% quality of sex with a non-significant other; with 100% probability of getting caught was completed. Then the probability of getting caught decreased to 90%, and the hypothetical choice trials were repeated in the same decreasing percentage order.

Condition B

During the second condition, participants completed a monetary outcomes probability discounting task. The task included choices between a decreasing amount of money received for sure and \$1,000 with a probability of being received. The decreasing value of monetary rewards (1000, 990, 960, 920, 850, 800, 750, 700, 650, 600, 550, 500, 450, 400, 350, 300, 250, 200, 150, 100, 80, 60, 40, 20, 10, 5, and 1) were replicated from Dixon et al., (2003). The probabilities of receiving the large \$1,000 outcome amount were the same probabilities used in the first condition for the probability of getting caught engaging in infidelity. The second condition was presented between sexual outcome probability discounting conditions to control for carryover effects. The first trial presented a choice between \$1,000 for sure and \$1,000 with a 100% chance of receiving the money. The next trial presented a choice between \$990 for sure and \$1,000 with a 100% chance of receiving the money. The value of the monetary amount received for sure continued to decrease until the choice between \$1

for sure and \$1,000 with a 100% chance of receiving the money was completed. Then the probability of receiving the uncertain \$1,000 outcome decreased to 90%, and the trials repeated the decreasing monetary outcome choice trials.

Condition C

During the third condition, participants completed a sexual outcomes probability discounting task similar to the probability discounting task used in the first condition. Before participants completed the third condition the researcher reviewed the definition for perceived overall quality of relationship and introduced instructions to alter the participant's perceived quality of overall relationship to a percentage of 70%. When the participant completed the third condition the researcher read a debriefing script and thanked the participants for their participation.

Statistical Analysis

The dependent variable used during statistical analysis was the indifference points of each participant. These indifference points were used to calculate the AUC values of participant discounting during each condition. Several independent t-tests were used to identify differences between group AUC values and within group AUC values across conditions. Pearsons correlations were used to identify the correlations between sexual outcome conditions. Paired samples *t* tests were used to identify statistical differences between sexual outcome conditions. To control for an inflated p value, the bonferroni correction procedure was used to calculate the p-value for each statistical test while ensuring the overall p-value for all test combined did not exceed .05. The p-value for all statistical tests was set to $p \leq .003$ and the familywise p-value was $p < .05$. All statistical tests were conducted using SPSS 19.

CHAPTER 3

RESULTS

Orderliness of Data

Theoretically, the indifference points for the sexual outcomes should increase across decreasing probabilities of getting caught engaging in infidelity and the indifference points for the monetary outcomes should decrease across decreasing probabilities to receive the money. The difference between indifference point directions across successive probability amounts within the sexual outcome conditions and monetary outcome condition is a result of the type of outcome (risk) associated with the decreasing probability amounts. The sexual outcomes discounting tasks becomes progressively less risky as the probability of getting caught engaging in infidelity decreases. The monetary discounting task becomes progressively more risky as the probability of receiving the money decreases.

To identify nonsystematic choices, one criterion used in Dixon et al., (2003) was applied to the present sets of indifference. Within sexual outcome conditions, participants' data were considered systematic if there was not more than one indifference point decrease from the previous indifference point. Within monetary the monetary outcome condition, participants' data were considered systematic if there was not more than one indifference point increase from the previous indifference point. Additionally, if participant choices resulted in more than one indifference point within a condition, their data was excluded. Based on these criteria, 6 of the 44 participants were excluded. Two participants were excluded due to more than one indifference point increase during condition B (monetary outcomes). Two participants were excluded due

to more than one indifference point decrease during condition C (sexual outcomes). Two participants were excluded due to multiple indifference points within the conditions. The 38 remaining participants were separated into two groups (past-infidelity and never-infidelity) based on whether or not they had reported a history of engaging in infidelity either in their current relationship or a past relationship. There were 19 participants in the past-infidelity group and 19 participants in the never-infidelity group. Table 1 lists a summary of the demographic variables and perceived overall quality of relationship of individual participants.

Discounting Outcomes

Table 2 lists the AUC value of each participant individually, as well as, the mean AUC value of the past-infidelity and never-infidelity groups for condition A (sexual outcomes), condition B (monetary outcomes), and condition C (sexual outcomes). High AUC values represent risk-taking behavior and low AUC values represent risk-averse behavior for all three conditions. The mean AUC values for the past-infidelity group were .4237 ($SD = .3133$), .3387 ($SD = .1419$), and .3975 ($SD = .2673$) for condition A, condition B, and condition C, respectively. The mean AUC values for the never-infidelity group were .0451 ($SD = .1034$), .4073 ($SD = .2375$), and .0905 ($SD = .1512$) for condition A, condition B, and condition C, respectively. To identify whether the differences between groups' discounting outcomes were statistically significant, the AUC for the past-infidelity and never-infidelity groups were compared during all three conditions. Between-groups independent t tests indicated differences between the AUC values of the past-infidelity group were statistically significant compared to the AUC values of the never-infidelity group in condition A, $t(36) = 5.00$, $p < .001$ and in condition C, $t(36) =$

4.36, $p < .001$; however, there was no significant difference between groups in condition B, $t(36) = 1.08$, $p = .29$.

Figure 1 depicts the outcome of the discounting task for the past-infidelity group and the never-infidelity group during condition A (sexual outcomes). Figure 2 depicts the outcome of the discounting task for the past-infidelity group and the never-infidelity group during condition B (monetary outcomes). Figure 3 depicts the outcome of the discounting task for the past-infidelity group and the never-infidelity group during condition C (sexual outcomes). The data was graphed based on the odds against receiving the outcome using the equation $O = (1/p) - 1$, where O equal the odds against amount, and p equals the probability of receiving the outcome (Rachlin et al., 1991). With the probabilities of 1, .90, .75, .50, and .25 the odds against were calculated to 0, .11, .33, 1, and 3, respectively. The risk of getting caught engaging in infidelity during condition A and condition C decreased as the odds against receiving the outcome increased. The risk associated with the chance to receive \$1,000 during condition B increased as the odds against receiving the outcome increased.

Paired samples t test were conducted to identify differences of discounting within groups across commodities (conditions). A within-group paired samples t test indicated AUC values for the never-infidelity group were significantly lower during condition A when compared to the AUC values of the same group during condition B, $t(18) = 5.82$, $p < .001$ and the AUC values were significantly lower during condition C when compared to condition B, $t(18) = 5.31$, $p < .001$. A within-groups paired samples t test indicated no difference between the AUC values of the past-infidelity group during condition A and condition B, $t(18) = 1.02$, $p = .32$ and condition B and condition C, $t(18) = .92$, $p = .37$.

Relationship Quality

The perceived overall quality of the relationship for each participant is listed in Table 1. The mean perceived overall quality of the relationship for all participants was 85% (Range = 100% to 25%). An independent t test was conducted to identify whether the past-infidelity group and never-infidelity group differed in the value of their perceived overall quality of relationship. The test indicated the perceived overall quality of the relationship of the never-infidelity group ($M = 97\%$, $SD = 9\%$) was significantly higher than the perceived overall quality of the relationship of the past-infidelity group ($M = 73\%$, $SD = 23\%$), $t(36) = 4.21$, $p < .001$.

Perspective Taking

A paired-samples t test was conducted to identify significant differences in discounting of sexual outcomes between condition A ($M = .23$, $SD = .30$) in which the participants were instructed to base their choices on their perceived overall quality of relationship and condition C ($M = .23$, $SD = .26$) in which the participants were instructed to base the choices on an overall quality of relationship of 70%. The test indicated no significant difference between the AUC values of the two conditions, $t(37) = .26$, $p = .80$. Additionally, a Pearson correlation showed a significant positive correlation between the AUC values of condition A and condition C, $r(36) = .68$, $p < .001$. When participants were separated into groups based on whether they rated their relationship above 70% or below 70%, a Pearson correlation showed a significant positive correlation between the AUC values of condition A and condition C for the group of individuals who rated the overall quality of their relationship above 70%, $r(37) = .74$, $p < .001$. However, there was no correlation between the AUC values of condition A and

condition C for the group of individuals who rated their overall relationship below 70%, $r(37) = .38, p = .31$.

Gender Differences

Several independent t tests were conducted to identify whether gender differences were present a) within past-infidelity and never-infidelity groups, b) between perceived overall relationship quality, and c) between AUC values from condition A (sexual outcomes). There was no significant difference between the number of males ($M = 12$) and females ($M = 7$) in the past-infidelity group, and the number of males ($M = 7$) and females ($M = 12$) in the never-infidelity group, $t(36) = 1.64, p = .11$. There was no significant difference of perceived overall quality of relationship between males ($M = 80\%$, $SD = 22\%$) and females ($M = 90\%$, $SD = 19\%$), $t(36) = 1.51, p = .14$. Also, there was no significant difference between the AUC values of males ($M = .36, SD = .31$) and females ($M = .10, SD = .23$) in the sexual outcome conditions, $t(36) = 2.98, p = .005$.

CHAPTER 4

DISCUSSION

Discounting Outcomes

The current study shows a statistically significant difference between the AUC values of the past-infidelity group and never-infidelity group. This difference indicates individuals who have engaged in infidelity in the past are more risk-taking when compared to individuals who have never engaged in infidelity with responses for sexual behavior. This finding supports the common assumption that individuals who have engaged in infidelity in the past may be more likely to engage in infidelity again. However, the choice to engage in sexual intercourse with a non-significant other was influenced by the setting events the individual was currently experiencing which included but was not limited to: the chance of getting caught, and the quality of sex available from the significant other and the quality of sex available from the non-significant other. Additionally, the lack of difference in discounting outcomes between groups during condition B (monetary outcomes) suggests different risk-taking responses based upon the commodity.

A comparison of within-group AUC values across commodities (conditions) explored this commodity difference further. The never-infidelity group had significantly higher AUC values in condition A and condition C (sexual outcomes) when compared to condition B (monetary outcomes). Previous research has indicated no difference between the discounting outcomes of different commodities when utilizing a probability discounting procedure (Estle et al., 2007). Similarities of differences in risk-taking are shown by similarities or differences in AUC values across conditions. The similarities in

AUC values across conditions of different commodities for the past-infidelity group indicate they respond with approximately the same amount of risk-taking for both monetary outcomes and sexual outcomes related to infidelity. The difference in AUC values across conditions of different commodities for the never-infidelity group indicates they are less risk-taking when responding to sexual outcomes related to infidelity compared to monetary outcomes. This difference provides additional evidence that state-based variables account for risk-taking behavior. Previous research has investigated whether delay discounting outcomes are affected by state-based variables (Dixon et al., 2006; Estle et al., 2007; Green et al., 1994; Green & Myerson, 2004; Logue & Anderson, 2001; Myerson et al., 2003; Ramussen et al., 2010; Whelan & McHugh, 2009; Xu et al., 2013). The current study extends the finding of probability discounting research by showing different commodity types can change the risk-taking responses from the same individual and provides additional evidence that risk-taking choices are influenced by state-based variables. Johnson and Bruner (2012) did not set out to investigate state-based versus trait-based variables within their study; however, while utilizing a delay discounting task with two different outcome choices (e.g. sex with a condom and sex without a condom) their results showed different participant responses were dependent on state-based variables of the choices (e.g. physical attractiveness of the sexual partner option and risk of STI in that individual); which, influenced the risk-taking and impulsivity of their participants.

Interestingly, all of the participants from both the past-infidelity group and the never-infidelity group who chose the non-significant other option during condition A (sexual outcomes) also chose the non-significant other option during all probabilities of

getting caught during this condition. Similar results occurred during condition C, with the exception of two participants (one from each group). The two participants that were the exception only chose the non-significant other option under the 25% probability of getting caught. This indicates that the quality of sex may be a dominate factor, or influenced their responses more than the probability of getting caught for the majority of all individuals when making the choice of whether or not to engage in infidelity. This replicates previous research that indicates the quality of sex is a factor related to infidelity (Buss & Shackelford, 1997; Mark et al., 2011). The significantly higher AUC values of the past-infidelity group when compared to the AUC values of the never-infidelity group could be a result of the past-infidelity group perceiving their quality of relationship as lower.

Relationship Quality

The past-infidelity group ($M = 73\%$) revealed a significantly lower average of perceived overall quality of relationship when compared to the never-infidelity group ($M = 97\%$). This difference suggests the perceived overall quality of the relationship is a predicting factor of infidelity and is consistent with findings in previous studies that indicated the quality of the relationship was correlated with engaging in infidelity (Buss & Shackelford, 1997; Drigotas et al, 1999; Mark et al., 2011; Treas & Geisen, 2000; Whisman et al., 2007). The lower overall relationship quality could explain why the AUC values of the past-infidelity group were higher than the AUC values of the never-infidelity group during condition A (sexual outcomes).

Skinner (1974) discusses how the current state of an individual can change frequently throughout time depending on the setting events and the state the individual

is experiencing is paired with response classes of behavior. Skinner also explained, when a stimulus has been paired with a behavior in the past and that behavior was followed by reinforcement, it is probable that the behavior will occur again when the same stimulus is presented in the future (1974). In other words, two individuals may experience the same stimuli, but depending on how that stimulus is related to contingencies of behavior that were previously experienced; the behaviors of both individuals in the presence of the same stimulus may be different. This suggests that individuals whom have engaged in infidelity in the past (past-infidelity) may experience a low relationship quality in a different way than an individual who has not engaged in infidelity in the past (never-infidelity).

This also generalizes to how an individual perceives their relationship. The perceived overall quality of a relationship may change from day to day and even moment to moment based upon the setting events, context of the relationship, and specific characteristics of the relationship within that moment. It may be that participants in the past-infidelity group engaged in infidelity in the past while they perceived the quality of their relationship to be a low quality. If an individual has engaged in infidelity behavior in the past while the stimuli of perceived low overall quality of relationship and low quality of sex are present and this behavior was reinforced, it would increase the likelihood that this behavior would occur again in the future when the same stimuli are present. The infidelity behavior could, in effect, decrease the perceived quality of relationship even more, or influence the perceived overall quality of relationship to decrease to this lower level more frequently. An individual who has never engaged in infidelity in the past may choose to never engage infidelity even if the quality of the

relationship reaches a low level; thus, the stimulus and behavioral contingency was never paired and they experience a low quality of relationship in a different way.

A significant difference between groups provides further evidence of the state-based variables that affected the discounting outcomes within this study. If participants in the past-infidelity group responded in patterns similar to previous research on trait variables, their discounting rates would remain steep regardless of their perceived relationship quality due to their risk-taking being a trait rather than based on their current state. There are possibly many setting events, contextual factors, and relationship characteristics that influence the perceived quality of a relationship at any given moment.

Perspective-Taking

To identify whether responses to sexual outcomes could be modified, the overall quality of the relationship was presented as 70% for all participants using a NOW-THEN relationship frame, prior to participants' completion of condition C (sexual outcomes). A comparison of the AUC values during condition A and condition C indicated no significant difference. In addition, there was a correlation of participants AUC values between condition A and condition C. The presentation of the 70% overall quality of relationship using a NOW-THEN relational frame was ineffective in modifying the responses of participants during condition C. The difference between the overall relationship quality of the past-infidelity group and the never-infidelity group demonstrated a possible relation between the overall relationship quality and the responses to the discounting paradigm; however, this does not imply the overall relationship quality is a cause of participant responses.

Participants may have been unable to accurately identify what they would do if the overall quality of their relationship was different from its current state; which may affect how their relational frames are formed based on the environmental variables they are currently in contact with. Relational frames are a cognitive process and an outcome (Hayes et al., 2001). The process involves two or more stimuli becoming related to each other within a specific context and the outcome then results in stimuli being related to each other in similar contexts in the future and often placed into a relational network (Hayes et al., 2001). The current state of the relationship can be a context which induces specific relations that have been relationally framed in the past during similar situations. Additionally, those same stimuli that are relationally framed in that specific context can have an entirely different meaning and be related to different stimuli in a different context. For example, when an individual's significant other is attempting to have sex with them, the individual's responses may be under the control of differing contextual variables, even if the behavior of their significant other is the same in both contexts. When the setting events and state of the relationship are experienced by an individual which makes engaging in sexual intercourse with a significant other reinforcing and that individuals' significant other attempts to have sex with them, they are likely to feel loved, wanted, and attractive; whereas, when the setting events and state of the relationship are experienced by an individual in which engaging in sexual intercourse with a significant other is punishing and that individual's significant other tries to have sex with them, they may feel annoyed, pressured, insecure, and avoid sexual intercourse. Skinner (1974) also discussed perspective-taking as being under the control of the setting events and state in which the participant is currently

experiencing because the contingencies in that particular setting and state are the contingencies that effected behavior in that the past. The behavior of an individual on a particular state is not always monitored by the individual to the extent that they could give a reliable description of what they would do, even if they have been on that same context in the past (Skinner, 1974).

The responses in this probability discounting task occurred while in the context of the perceived quality of relationship indicated by the participants prior to condition A. The results of the comparisons of AUC values from condition A and condition C suggest the NOW-THEN relational frame was not able to modify the state of the relationship and the contingencies that are in effect during that state of the relationship during the participants choice trials in condition C. This implies that in order to identify the choices an individual would make during a different state of the relationship, the state of the relationship has to be the state during which the choices would actually be made; otherwise, stimuli that affect choices during that state would not be effective. Hayes et al., (2001) explained this situation as choices and judgments that occur right now, about another time and place, are rarely from the same perspective that individual would actually have during that time or place. A procedure that reminds the participants of the contingencies that are in effect during a state of the relationship other than the current state may be more effective than the introduction of a NOW-THEN relational frame.

The instruction to choose between sexual partners based on a 70% overall quality of relationship with a significant other may have been too vague. When a stimulus is vague, the conditions with the present setting are more likely to affect the behavior or responses of that individual (Skinner, 1974). Different discounting rates may

have been shown if the researcher provided a particular situation in the form of a scenario that closely resembled a situation in the past of each relationship that brought the 70% relationship quality and evoked stimuli or responses in the form of emotions that were present during that context of the relationship. Skinner (1974) explains that “seeing does not require a thing seen”; however, the affect of the unseen thing has to exert enough control over behavior to override the control of the stimuli in the present context.

Gender Differences

There were no statistically significant differences between the number of females and males within the past-infidelity and never-infidelity groups. This indicates the between group AUC value differences are not a result of the past-infidelity and never-infidelity groups containing more participants of one gender type than the other group. Research studies in the past have indicated males as more likely to engage in infidelity than females; however, more recent research has indicated there is no gender difference between individuals who do and do not engage in infidelity (Chandra et al., 2011; Mark et al., 2011; Treas & Giesen, 2000). This decreasing gender difference between individuals who engage in infidelity may result from women being more independent within the present society and in effect being presented with more opportunities to engage in infidelity. This finding provides evidence against the theory that males are more likely to engage in infidelity due to genetics or a personality trait and provides evidence to support the behavioral perspective of environmental factors contributing to the occurrence of infidelity behavior.

There was no difference between genders on the perceived quality of the relationship. Neither males nor females perceived the overall quality of their relationship as a higher value than the other gender. This indicates that the significant difference between perceived relationship quality in the past-infidelity group and never-infidelity group is not an effect of gender differences. This is inconsistent with previous studies that indicated opposing gender differences. Buss and Shackelford (1997) indicated infidelity in females was more correlated with the quality of relationship than males. Mark et al., (2011) also indicated relationship quality was more correlated with infidelity in women when compared to the factors that correlate to infidelity in males. However, the purpose of these studies were to identify factors that influence the choice to engage in infidelity and the gender differences that were pointed out were not statistically tested.

There was also no significant difference between the AUC values of males and females during the sexual outcome conditions. Males had higher AUC values (made more risk-taking choices) than females but these differences were not statistically significant. This is consistent with previous research conducted by Lawyer and Schoepflin (2013) that found no gender difference when discounting the activity of sexual intercourse using a probability discounting and delay discounting procedure indicating both genders are similarly reinforced by sexual activity. Johnson and Bruner (2013) found that males were more likely to choose immediate sex without a condom than females indicating males are more impulsive than females with condom use.

General Conclusions

This study is the first study to provide evidence of the difference in the discounting of the quality of sex between groups of individuals who have engaged in

infidelity in the past and individuals who have not engaged in infidelity in the past. It is different from previous sexual outcome discounting studies because it recruited participants between the ages of 18 and 63 from the community rather than from a college student population. College student sexual behavior may differ from community members because of the setting events and contextual factors that are in effect within the college environment and the limited age ranges of the typical college student. This study shows choices regarding infidelity can be identified using a probability discounting procedure and the choices of individuals who have engaged in infidelity in the past generally differ from individuals who have never engaged in infidelity in the past. It may be beneficial for relationship therapists to take into account the possibility that the perceived quality of sex within a relationship may be a factor for an individual who has engaged in infidelity in the past. If a therapist can identify the quality of sex as a problem within a couple's relationship, it will allow them to be able to concentrate on that problematic area during their treatment.

This study also identified instructions using a NOW-THEN relational frame to make choices from the perspective of a different state of the relationship were ineffective. This indicates that a therapist is unlikely to get the same responses from an individual while they are experiencing a different state of the relationship than the state they are experiencing when they make the choice to engage in infidelity. If the therapist is able to identify and provide treatment during the state of a relationship in which infidelity occurs or when problems within the relationship occur, the treatment provided may be more effective than when it is provided during a state of the relationship that is not problematic to the relationship.

The comparison of AUC values between-groups and within-groups across conditions provides evidence that state-based variables (e.g. commodity) can modify the risk-taking choices of the participants within the sample. This shows evidence against the theory that sexual outcome discounting is based upon a trait (i.e. personality) within the individual rather than setting events. This also extends the state-based variable of commodity which influences risk-taking choices to the probability discounting procedure.

Limitations

This study has several limitations. The first limitation is the small quantity of participants within the study. A larger group of participants would decrease the probability of a type II error. A type II error within the results would indicate that there was no difference between groups when there actually was a difference between groups, but the groups were not large enough to detect the difference in statistical tests. In addition a larger group of participants would allow a comparison of age groups to identify whether the probability of engaging in infidelity is related to age.

A second limitation is participants self-reported their infidelity behavior. This could affect the percentage of individuals who had engaged in infidelity within this sample. However, the researcher attempted to control for this limitation by providing the most private setting possible for the participants to complete the study to facilitate honest answers to all questions, including: allowing the participant to have personal space, not allowing any third party individuals to be in the room, and excluding names of the participants from being used within this study.

The third limitation is the setting in which the participants completed the study. The setting was not consistent across participants which may have affected the results. Although in each setting the experimenter attempted to control for setting confounds by implementing the setting criteria stated previously. Dixon et al. (2006) indicated that individuals who are make choices about behavior in the same setting they are in when they typically make those choices in real life situations discount differently than when they are in a different setting. It is unknown whether the participants completed the study in a setting that they usually make choices about infidelity, and the affects of this are unknown within this study.

A fourth limitation is the participants themselves were recruited by flyers to participate in a study about sexual behaviors. The community members that volunteered to participate in a study about sexual behavior may have found the topic of sex and the behavior of sex more enjoyable. The flyer also mentioned it would investigate the quality of sex and probability of getting caught engaging in infidelity within a monogamous relationship. This may have recruited individuals who have engaged in infidelity in the past and individuals who have not engaged in infidelity in the past that were more confident in their sexual infidelity choices.

Future Research

Future research could identify whether individuals who are married or dating differ in discounting outcomes. Treas and Geisen (2000) indicated the type of relationship (married or dating) was a factor influencing whether an individual would or would not engage in infidelity. However, this study did not recruit enough participants to identify whether or not there was a difference within this sample. The sexual outcomes

probability discounting task could also be used to identify whether there are differences in discounting outcomes between individuals who are currently in a relationship and currently single. A comparison of these two population types would provide evidence for state-based discounting during the sexual outcomes probability discounting task. This study did not compare the overall quality of relationship ratings of individuals whose significant other also participated in the study. It would be interesting to compare the discounting outcomes and relationship quality ratings of couples in a relationship to determine if they share a common perception of the relationship quality and exclusivity within their relationship. Another interesting study would identify whether parents model their sexual behaviors to their offspring by identifying whether they share the same discounting outcomes on the sexual discounting procedure. Past research has shown that parents and their children have similar discounting outcomes when using monetary amounts (Reynolds, Leraas, Collins, & Melanko, 2009) and may be more likely to engage in infidelity when aware of their parents infidelity (Platt et al., 2008). Future research could identify whether a procedure using mindfulness therapy could modify the perceived quality of the relationship to a degree that a difference would be indicated on the discounting task outcomes.

Table 1

Summary of Demographic and Relationship Quality Questionnaire Responses.

Participant Number	Age	Gender	Overall Relationship Quality Rating	History of Infidelity
Past-Infidelity				
P1	44	Male	90	Yes
P2	23	Male	50	Yes
P3	33	Female	25	Yes
P4	55	Female	90	Yes
P5	39	Male	93	Yes
P6	27	Male	60	Yes
P7	33	Female	25	Yes
P8	50	Male	80	Yes
P9	22	Female	75	Yes
P10	29	Female	90	Yes
P11	63	Male	75	Yes
P12	24	Male	100	Yes
P13	38	Female	95	Yes
P14	36	Male	65	Yes
P15	50	Male	65	Yes
P16	23	Male	60	Yes
P17	41	Female	100	Yes
P18	32	Male	90	Yes
P19	36	Male	60	Yes
Never-Infidelity				
P20	29	Female	99	No
P21	44	Male	100	No
P22	42	Male	100	No
P23	32	Female	100	No
P24	51	Female	100	No
P25	34	Male	100	No
P26	28	Female	100	No
P27	22	Female	97	No
P28	42	Female	100	No
P29	23	Female	60	No
P30	18	Male	95	No
P31	28	Male	90	No
P32	20	Female	100	No
P33	39	Female	100	No
P34	30	Female	100	No
P35	23	Female	98	No
P36	20	Female	100	No
P37	24	Male	100	No
P38	53	Male	100	No

Table 2

Individual and Group Area Under the Curve (AUC) Values for Condition A, Condition B, and Condition C.

Participant Number	Condition AUC Values			Participant Number	Condition AUC Values		
	Condition A	Condition B	Condition C		Condition A	Condition B	Condition C
Past-Infidelity	0.4237	0.3387	0.3975	Never-Infidelity	.0451	.4073	.0905
P1	0.525	0.32	0.5333	P20	0.01	0.6177	0.138
P2	0.595	0.4077	0.7433	P21	0.01	0.6691	0.01
P3	0.9103	0.411	0.6833	P22	0.2317	0.0822	0.1037
P4	0.01	0.26	0.01	P23	0.01	0.4783	0.01
P5	0.5883	0.3677	0.6617	P24	0.01	0.4877	0.01
P6	0.735	0.2883	0.6967	P25	0.4167	0.4794	0.4817
P7	0.2033	0.5193	0.2	P26	0.01	0.3543	0.0753
P8	0.4967	0.341	0.7333	P27	0.01	0.5827	0.05
P9	0.26	0.5433	0.2333	P28	0.01	0.4335	0.01
P10	0.01	0.29	0.01	P29	0.01	0.2283	0.01
P11	0.655	0.4117	0.47	P30	0.01	0.0669	0.01
P12	0.2433	0.4233	0.6283	P31	0.01	0.3443	0.3467
P13	0.0987	0.5893	0.15	P32	0.01	0.391	0.01
P14	0.515	0.4417	0.4417	P33	0.01	0.615	0.425
P15	0.4583	0.1407	0.5917	P34	0.01	0.2387	0.01
P16	0.0217	0.261	0.425	P35	0.05	0.07	0.08
P17	0.01	0.1107	0.01	P36	0.01	0.8993	0.01
P18	0.7283	0.241	0.24	P37	0.01	0.0676	0.01
P19	0.9867	0.0676	0.0917	P38	0.01	0.0669	0.01

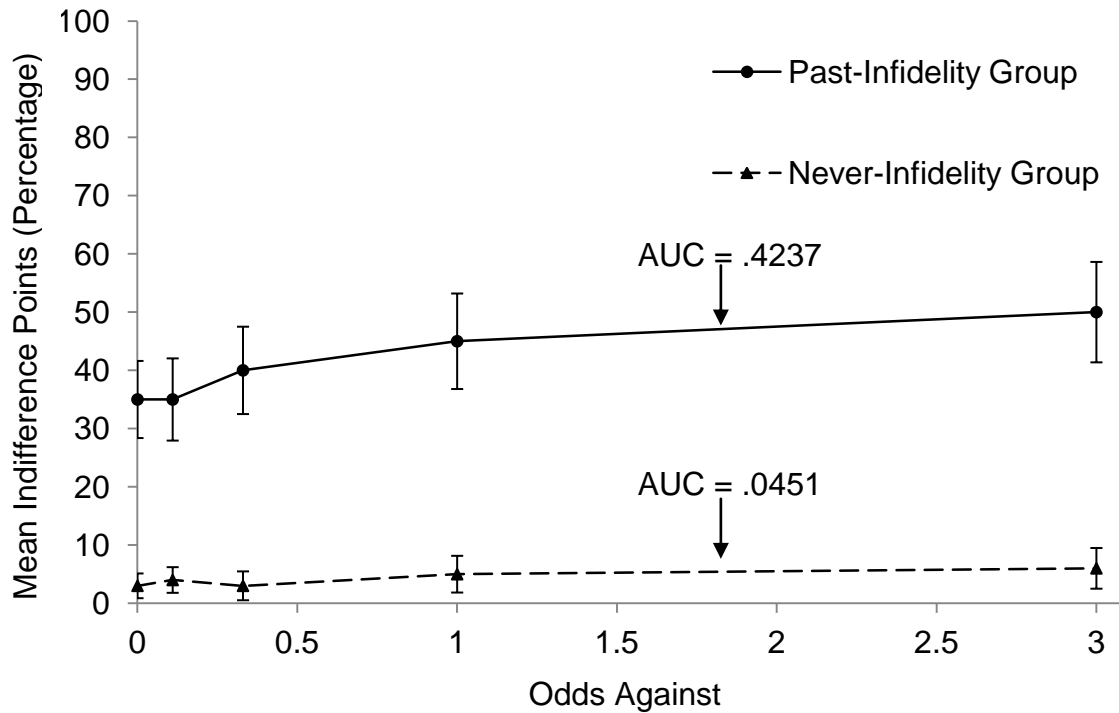


Figure 1. Condition A (sexual outcomes) group mean indifference point values. The solid line with the closed circles represents the values of the past-infidelity group across odds against receiving the outcome. The dashed line with the closed triangles represents the values of the never-infidelity group across odds against receiving the outcome. The error bars show the standard error for each data point. The increasing value of the indifference points across the odds against receiving the outcome reflects the decreasing risk using in this condition as opposed to an increase in risk that is typically used in delay and probability discounting paradigms.

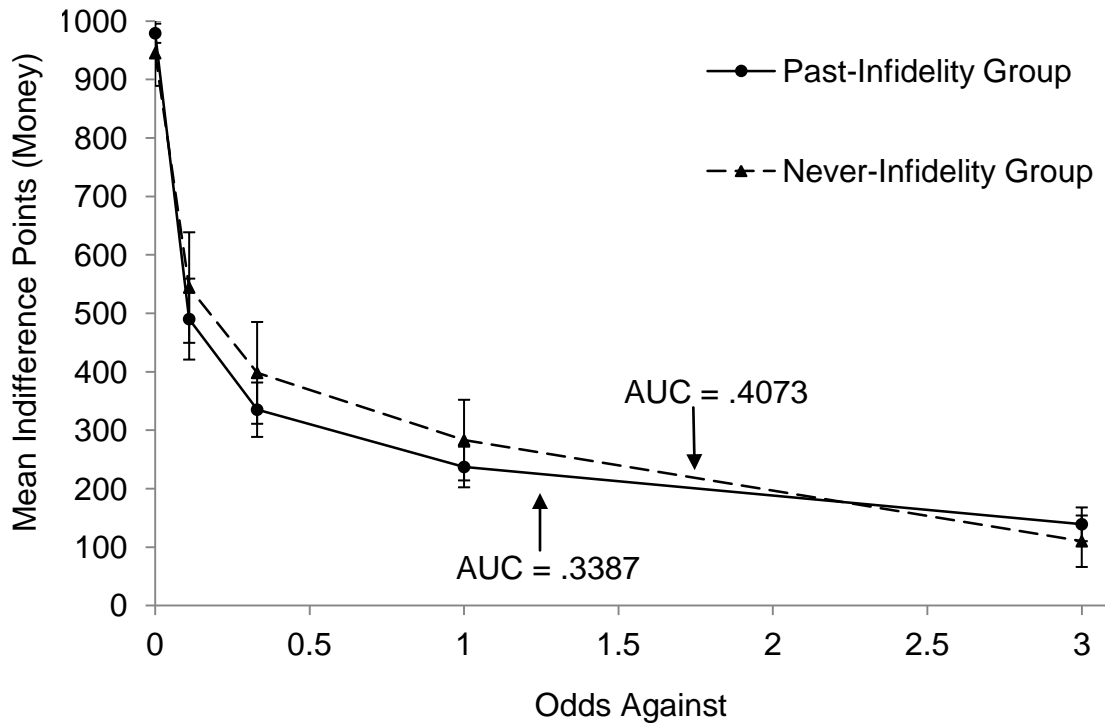


Figure 2. Condition B (monetary outcomes) group mean indifference point values. The solid line with the closed circles represents the values of the past-infidelity group across odds against receiving the outcome. The dashed line with the closed triangles represents the values of the never-infidelity group across odds against receiving the outcome. The error bars show the standard error for each data point.

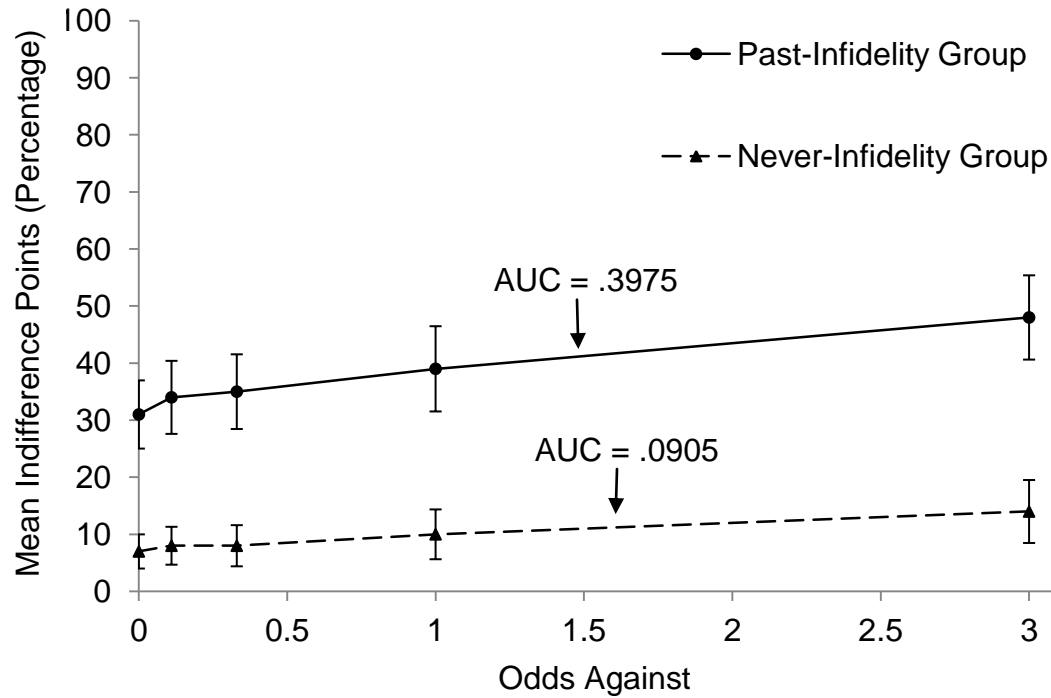


Figure 3. Condition C (sexual outcomes) group mean indifference point values. The solid line with the closed circles represents the values of the past-infidelity group across odds against receiving the outcome. The dashed line with the closed triangles represents the values of the never-infidelity group across odds against receiving the outcome. The error bars show the standard error for each data point. The increasing value of the indifference points across the odds against receiving the outcome reflects the decreasing risk using in this condition as opposed to an increase in risk that is typically used in delay and probability discounting paradigms.

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APPENDICES

APPENDIX A

Study Introduction Instruction:

“This research is completely confidential. Your name will not be used on any of the research documents or linked to your data in any way. If you do not feel comfortable answering hypothetical sexual questions you may leave at any time, you will not be punished in any way. There will be no consequences for choosing to stop participation at any time during this study. This study will take approximately two hours. There are two questionnaires and three tasks that you will complete during this study. I will give you the opportunity to ask questions before each task begins. Do you have any questions?”

Condition A Instruction:

“During the first task, I will guide you through several hypothetical questions about different types of sexual partners that you could engage in sexual intercourse with. The researchers are interested in which sexual experience you would choose if you were offered these choices for real. Two different types of partners are available; one partner option will represent your significant other and the quality of sex you engage in will vary, the other partner option will represent a non-significant other and the quality of sex you engage in will remain the same. Please remember this is a one-time event and not a multiple occurrence event. Please base your decision off of your perceived quality of your relationship. The probability of getting caught cheating will change. Please select your answer on the provided data sheet titled “Data Sheet Sexual Questions. If you become lost or forget what question number we are on; there is a

question number on the top left of every question slide. If you have any questions, please ask them now.”

Condition B Instruction:

“You have completed the first task. During the second task, I will guide you through hypothetical questions about different types of money rewards. The researchers are interested in which money reward you would choose if you were offered these choices for real. Two different types of money rewards are available; one money reward will be received for sure and the amount of that reward will vary, the other money reward will have a chance of being received and the chance of you receiving the money will change; however, the amount of money will remain the same. Please answer the questions as if you will be actually receiving the reward you choose. If you become lost or forget what question number we are on; there is a question number on the top left of every question slide. Please select your answer on the provided data sheet titled ‘Data Sheet Money Questions.’ If you have any questions, please ask them now.”

Condition C Instruction:

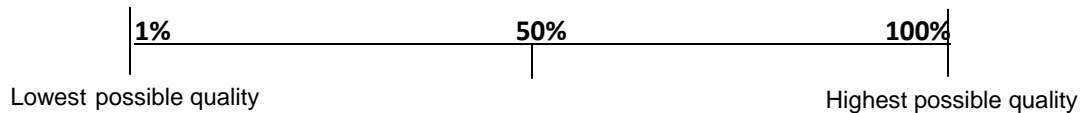
“Now, regardless of how you rated the quality of your relationship previously, your overall quality of your relationship has now changed to 70%. Please base all choice/decisions off of this new quality of your relationship. During the third task, I will guide you through several hypothetical questions about different types of sexual partners that you could engage in sexual intercourse with. This task is the same task you completed during task one. The only difference is that, while you are answering the hypothetical questions for task 3, keep in mind your rating of the overall quality of your

relationship is 70%. If you become lost or forget what question number we are on; there is a question number on the top left of every question slide. Please select your answer on the provided data sheet titled 'Data Sheet Sexual Questions 2.' If you have any questions, please ask them now."

APPENDIX C

Relationship Quality Questionnaire

Please use the scale below as a guide to answer the following questions.



1. Rate the named relationship characteristics, **in percentages**, as it relates to your current relationship if you are in one. If you are currently not in a relationship, rate the named relationship characteristics as it relates to you most current past relationship.
 - A. **Love** (key words- respect, romance, sensitivity, forgiveness, support):_____%
 - B. **Loyalty** (key words- lifetime commitment, loyalty to significant other, moral values):_____%
 - C. **Shared Values** (key words – conflict management, gender roles, religious beliefs, parenting):_____%

Perceived overall quality of relationship – The apparent value of all interactions and characteristics of your relationship with another person; that you find relevant to what a relationship should be like in your opinion.

- D. With this definition in mind, rate the perceived overall quality of your current relationship:_____%

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Thesis

Probability Discounting of the Quality of Sexual Relationships
Major Professor: Dr. Mark Dixon