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Commodity Specificity and Priming Effects on Discounting for Sexual and Monetary
Rewards

Frederick J. Schoepflin, B.S.

A thesis
submitted in partial fulfillment
of the requirements of the degree of
Master of Science in the Department of Psychology
Idaho State University
May 2014

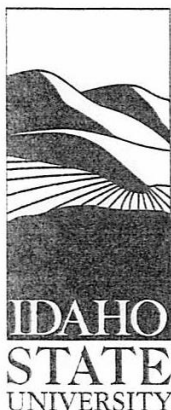
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RE: Your application dated 9/22/2010 regarding study number 3507: Stimulus Specificity in Delay and Probability Discounting

Dear Mr. Schoepflin:

Your request for approval of the new protocol listed above was reviewed at the 10/1/2010, meeting of the Idaho State University Human Subjects Committee.

You are free to proceed with your study as described in your protocol effective immediately.

The study is subject to renewal on or before 10/1/2011, unless closed before that date.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

Submit progress reports on your project in six months. You should report how many subjects have participated in the project and verify that you are following the methods and procedures outlined in your approved protocol. Then, report to the Human Subjects Committee when your project has been completed. Reporting forms are available on-line.

Please note that any changes to the protocol as approved must be immediately reported and approved. Contact Patricia Hunter (208-282-2179; fax 208-282-4529; email: humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP
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September 2, 2011

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RE: Your application dated 8/23/2011 regarding study number 3629: Effects of Priming on Delay Discounting for Different Outcomes

Dear Mr. Schoepflin:

Your request for approval of the new protocol listed above was reviewed at the 9/2/2011, meeting of the Idaho State University Human Subjects Committee.

You are free to proceed with your study as described in your protocol effective immediately.

The study is subject to renewal on or before 9/2/2012, unless closed before that date.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

Submit progress reports on your project in six months. You should report how many subjects have participated in the project and verify that you are following the methods and procedures outlined in your approved protocol. Then, report to the Human Subjects Committee when your project has been completed. Reporting forms are available on-line.

Please note that any changes to the protocol as approved must be immediately reported and approved. Contact Patricia Hunter (208-282-2179; fax 208-282-4529; email: humsubj@isu.edu) if you have any questions or require further information.

Sincerely,

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Abstract

Delay discounting is a behavioral measure of impulsive choice measured by assessing an individual's preference for smaller-immediate versus larger-delayed outcomes.

Probability discounting similarly measures impulsive choice by assessing preferences for larger-probabilistic versus smaller-certain outcomes. Very little research to date has assessed whether discounting for commodity-specific outcomes differentially predicts commodity-specific impulsivity-related outcomes. Experiment 1 compared patterns of discounting behavior for monetary and sexual outcomes in adult university students ($N = 102$) with self-reported sexual and general behavior, and found that discounting for sexual outcomes was more strongly associated with self-reported sexual outcomes than was discounting for money. Experiment 2 was designed to replicate the commodity-specific effect from Experiment 1 and to measure the effects of sexual priming on discounting in adult male undergraduates ($N = 126$). Results partially replicated Experiment 1 in that commodity-specific discounting tasks differentially predicted sexual self-report measures, but did not replicate other findings that sexual priming influenced patterns of discounting. Potential explanations for findings are discussed in independent sections after each study, and conceptual issues are addressed in the general discussion.

CHAPTER ONE

EXPERIMENT 1 INTRODUCTION

Delay and probability discounting

Delay discounting refers to the tendency for individuals to devalue an outcome less as a function of its delay or probability. The tendency to prefer small but immediately available rewards over larger but delayed rewards is consistent with behavioral theories of impulsive choice (Ainslie, 1975). Individual differences in delay discounting are measured by having individuals indicate their preference for a relative large, but delayed, outcome, and a smaller outcome that is adjusted across trials. In a standard delay discounting procedure (e.g., Rachlin, Rainieri, & Cross, 1991), an individual may be asked to choose between \$5 right now and \$10 in 1 month. In subsequent questions, the smaller amount of money is titrated incrementally, until an indifference point (the point where the two amounts are subjectively equivalent to the participant) is established for that delay. The same procedure is used to establish indifference points for several other delays.

Individual and group delay discounting rates can be characterized using Mazur's (1987) hyperbolic decay model:

$$V = \frac{A}{(1 + kD)} \quad \text{(Equation 1)}$$

In this equation, V represents the current subjective value of the larger outcome relative to the delay, A is the amount of the (larger) delayed outcome, held constant within each discounting task, D is the delay to receiving that outcome, and k is a free parameter that describes the rate of decrease in value as determined by the participant's responding on all tasks. Higher k values indicate steeper rates of discounting, which represent a

tendency to prefer smaller-sooner outcomes over larger-delayed outcomes.

A similar procedure is used for probability discounting (in which the value of an outcome diminishes as a function of its probability), except that the individual decides between a large outcome available with some probability and a smaller, adjusting outcome available “for sure”. Probability discounting data can be described with a similar hyperbolic decay model:

$$V = \frac{A}{(1 + hO)} \quad (\text{Equation 2})$$

In this model, V represents the current subjective value of the (larger) probabilistic outcome, A is the amount of the large outcome, O represents the odds against receiving the large outcome ($[1/p] - 1$, where p is the probability), and h describes the rate of decrease in value of the large outcome as a function of its probability. In this model, lower h values indicate a preference for larger-probabilistic outcomes over smaller-certain outcomes.

Discounting can also be described using an atheoretical approach (Myerson, Green, & Warusawitharana, 2001), in which the "area under the curve" (AUC) of individual or group indifference points is measured. In delay discounting, smaller AUC values indicate a preference for smaller-immediate outcomes and thus more impulsive decision-making. In probability discounting, larger AUC values indicate a relative preference for larger probabilistic outcomes and greater risk-taking.

Discounting as a fundamental behavioral process

Discounting is a robust predictor of a broad range of human health problem behaviors, including alcohol and illicit drug use (Vuchinich & Tucker, 1998; Kirby & Petry, 2004), obesity (Rasmussen, Lawyer, & Reilly, 2010; Saelens & Epstein, 1996),

obtaining and utilizing health care (Tucker & Davison, 2000), gambling (Reynolds, 2006), tobacco use (Bickel, DeGrandpre, & Higgins, 1993; Reynolds, Richards, Horn, & Karraker, 2004), attention-deficit hyperactivity disorder (Critchfield & Kollins, 2001), and health behavior in general (Simpson & Vuchinich, 2000).

The health behaviors listed above share discounting as a common behavioral process in that individuals who exhibit problematic health behaviors tend to be more sensitive to the immediate (typically rewarding) consequences of their behavior than they are to the delayed (and typically aversive) consequences. This process is most notable in the context of substance use and abuse (Bickel & Johnson, 2003; Bickel, Miller, Yi, Kowal, Lindquist, & Pitcock, 2007) in which drug and/or alcohol use is maintained by the immediate consequences (e.g., disinhibition, decreased sensitivity to anxiety and physical pain) more so than the delayed and negative social, physiological, emotional, and/or occupational consequences.

In clinical studies involving discounting (including those listed above), individuals exhibiting the problem behavior in their daily lives tend to produce higher rates of discounting in the laboratory setting. More recently, and perhaps more representative of a fundamental behavioral mechanism, discounting has been conceptualized as a trans-disease process, in that a range of human health problem behaviors may be predicted by an individual's rate(s) of discounting (Bickel & Mueller, 2009).

Contextual and individual differences in impulsive decision-making

The vast majority of experiments involving discounting research quantify patterns of discounting among health problem behavior groups and controls by comparing

patterns of discounting for monetary outcomes. Money is the outcome of choice in most of these studies due to its generalized properties as a secondary (i.e., conditioned) reinforcer, and the ease with which researchers are able to substitute hypothetical monetary rewards for real or potentially real outcomes and evoke similar discounting patterns in participants (Madden, Begotka, Raiff, & Kastern, 2003; Lawyer, Schoepflin, Green, & Jenks, 2011).

What is less clear is whether these patterns of impulsive choice represent universal patterns of behavior that occur across contexts or whether these behaviors are better understood as context-specific. Behavioral theorists typically emphasize the dynamic role of contextual factors in individual behavior (e.g., Skinner, 1953; Mischel, 1969), while orthodox personality theories emphasize the stability of behavior across contexts (Costa & McCrae, 1992; Terraciano & Costa, 2004; Ozer & Benet-Martinez, 2006). Proponents of a combination of these perspectives (e.g., Fleeson, 2004; Bandura, 1978) assert that, while traits may predict long-term patterns of behavior, momentary decisions are made on a situation-dependent basis. In these models, individual behavior patterns may be relatively consistent over time, but there are meaningful contextual factors that influence behavior at any one time. For instance, Dixon, Jacobs, and Sanders (2006) have demonstrated that pathological gamblers produce steeper rates of discounting when in the natural context in which they gamble, relative to a neutral context. Loewenstein (1996) theorizes that the strength of the context's influence on individual behavior is jointly due to the establishing operations of a given situation and our tendency to underestimate our sensitivity to their relevant contingencies.

The context in which an individual makes decisions depends not only on the

opportunity to act on the environment in different ways, but also on the nature of the contingency (e.g., reward) for a given task. Although discounting researchers historically have used discounting for money as an index of a broader pattern of impulsive choice, recent research has suggested that commodity-specific discounting tasks may produce similar (and yet still noticeably different) discounting patterns. Estle, Green, Myerson, and Holt (2007) compared delay and probability discounting for several directly consumable outcomes (i.e., beer, candy, and soda) with that for money, and found that all outcomes were discounted in a hyperbolic manner (i.e., the subjective value of a delayed outcome decreased as the delay increased). This indicates that discounting is a trans-commodity process. However, the study's results also indicated that directly consumable rewards were all discounted at a steeper rate than money when larger outcomes were presented after a delay. This combination of findings suggests that, while discounting is a trans-commodity process, the nature of the commodity may influence an individual's rate of discounting, and that different outcomes produce quantitatively different (though perhaps qualitatively similar) patterns of behavior.

Similarly, Odum (2011) recently reported a re-analysis of discounting data across several commodities and found that monetary outcomes were consistently discounted at a shallower rate compared to directly consumable rewards. However, in contrast to Estle et al. (2007), her analysis also revealed significant correlations in rates of discounting across those commodities within individuals. She asserted that such correlations indicate that discounting behavior may be conceptualized as a trait, consistent with orthodox personality models, and may be stable across contexts and/or commodities.

The present study does not challenge the assertions made by Odum (2011), but

rather attempts to integrate the bulk of findings which indicate that fungible rewards (i.e., money) and directly consumable rewards (e.g., food, alcohol, illicit drugs) typically evoke quantitatively different patterns of responding. For example, Jackson and Hackenberg (1996) trained token reinforcement in pigeons and compared discounting rates of tokens and food, and found that subjects discounted food rewards steeper than token rewards of equal value. Similarly, numerous studies examining rates of discounting for monetary and non-monetary outcomes find that monetary outcomes are discounted at a shallower rate than food (e.g., Odum & Rainaud, 2003; Estle et al., 2007), cigarettes (Mitchell, 2004; Field, Santarcangelo, Sumnall, Goudie, & Cole, 2006), alcohol (Odum & Rainaud, 2003; Estle et al., 2007), cocaine (Coffey, Gudleski, Saladin, & Brady, 2003), and heroin (Madden, Petry, Badger, & Bickel, 1997; Odum, Madden, Badger, & Bickel, 2000), even if the absolute values of the outcomes are standardized. While these studies suggest that commodity-specific outcomes are discounted at different rates than monetary outcomes, it is unknown whether stimulus-specific tasks produce more valid responding relative to analogous real-world behaviors. This dearth of applicability limits the theoretical import that discounting tasks currently have in a clinical context; in essence, the use of directly consumable outcomes is not yet a widely accepted method of measurement, despite potentially producing discounting patterns that may be more predictive of real-world (e.g., health) behavior. Thus, further discounting research examining the mechanisms that underlie the relationship between monetary and commodity-specific outcomes is warranted.

Importantly, Rasmussen et al. (2010) found that people with higher percent body fat (PBF) concentrations discount hypothetical food at a steeper rate than those with

lower PBF concentrations, but that these groups discount monetary outcomes at similar rates. The authors assert that these group differences within one commodity, but not another, indicate a commodity-specific effect in discounting. Further, they contend that, since individuals differentially value food as a reward based on their physiological makeup, discounting for food may be a better predictor of food-related health outcomes than is discounting for money. More recent research (e.g., Hendrickson & Rasmussen, 2013) examining differences in discounting for food and money have since replicated this commodity-specific finding.

Discounting for sexual outcomes

Given the commodity-specific group differences found in Rasmussen et al. (2010), it is important to examine the extent to which the outcome type may differentially predict discounting rates in other health behavior contexts. Sexual decision-making is a clinically-relevant behavior which has recently received attention in the discounting literature, especially in the context of sexual risk behavior (SRB) such as having unprotected sexual intercourse. Discounting is potentially relevant to the understanding of SRBs since such behaviors are likely influenced more by the immediately rewarding consequences of sexual activity (e.g., sexual stimulation, orgasm) than by the delayed and probabilistic negative consequences (e.g., sexually-transmitted infection, unwanted pregnancy). Indeed, researchers (e.g., Chesson et al, 2006) have demonstrated that SRBs, like many other non-monetary health outcomes, are predicted by an individual's delay discounting behavior for monetary outcomes.

While it appears that discounting for money is a reasonably good predictor of SRBs, it is not clear whether a commodity-specific measure of impulsive choice of sexual

outcomes may predict sexual outcomes differently (and perhaps more accurately) than monetary ones. Several research studies to date suggest that impulsive choice for sexual outcomes can be evoked using discounting procedures. Lawyer (2008) originally reported that erotica users discounted the value of hypothetical erotica in a manner consistent with the hyperbolic decay model, suggesting that discounting for hypothetical sexual outcomes might also conform to such patterns. Accordingly, Lawyer, Williams, Prihodova, Rollins, and Lester (2010) found that sexually active college students discounted the value of delayed and probabilistic hypothetical sexual activity in a manner consistent with other outcomes. Even more recently, a few researchers have applied novel discounting procedures to the study of sexual decision-making (e.g., Jarmalowicz, Bickel, and Gatchalian, in press; Johnson and Bruner, 2012), and Johnson and Bruner found that discounting for sex, but not money, was associated with self-reported sexual risk behavior in cocaine-dependent adults. These recent findings provide an impetus for further comparison of discounting for money and hypothetical sexual outcomes, and their relationships with self-reported impulsive behavior.

Purpose of Experiment 1

The purpose of Experiment 1 was to evaluate whether discounting for commodity-specific outcomes differentially predicts content-specific constructs associated with real-world behavior. Delay and probability discounting tasks for monetary and sexual outcomes (Lawyer et al, 2010) were correlated with each other and with self-report measures regarding impulsivity-related sexual and non-sexual outcomes, and regression analyses were conducted with discounting data as the predictor and self-report measures as the criterion. We hypothesized that (1) discounting for sexual and

monetary outcomes would be significantly correlated, (2) discounting for sexual outcomes would more strongly predict self-reported sexual outcomes than would discounting for money, and (3) discounting for money would more strongly predict non-sexual outcomes than would discounting for sexual outcomes.

CHAPTER TWO

EXPERIMENT 1 METHOD

Participants

Participants were sexually-active adult undergraduates ($N = 102$) recruited from ISU introductory psychology classes. The majority of participants were female ($n = 65$, 63.7%) and the average age was 26.06 years ($SD = 8.89$, Range = 38). The majority of participants were Caucasian ($n = 88$, 86.2%), Christian ($n = 61$, 59.8%), and heterosexual ($n = 96$, 94.1%). See Table 1 for more detailed demographic information. Participants received course credit for their participation.

Self-report measures

All surveys were completed using a software program (MediaLab) that provided an interface for participants to read and answer study questions and downloaded participant responses into a SPSS database. This process facilitated participant anonymity and comfort answering sensitive questions. See Table 1 for descriptive data regarding the self-report measures. After providing basic demographic information, participants completed psychometric measures.

Sex-related psychometric measures

The *Sexual Desire Inventory* (SDI; Spector, Carey, & Steinberg, 1996) is a 14-item measure that assesses an individual's interest in both solitary and dyadic sexual activity (e.g., "When you spend time with your partner, how strong is your sexual desire?"). This measure has strong psychometric properties (Spector et al, 1996) and higher scores (range = 60-123) indicate a greater interest in sexual activity. The *Sexual Sensation Seeking Scale* (SSSS; Kalichman & Ronpa, 1995) is an 11-item measure that

quantifies an individual's interest in various sexual experiences (e.g., “uninhibited sexual encounters”) based on whether s/he believes a statement is representative of his/her sexual preference. Higher scores (range = 9 – 36) indicate a greater interest in a range of sexual experiences. The *Sexual Inhibition/Excitation Scales* (SIS/SES; Janssen, Vorst, Finn, & Bancroft, 2002) comprise 45 items that measure sexual excitability or sexual inhibition as defined by the dual control model (Bancroft, Graham, Janssen, & Sanders, 2009) of sexual arousal. dual control model of sexual arousal. The sexual excitability factor (23 items) asks about situations that increase sexual arousal. One sexual inhibition factor (SIS1; 13 items) asks about sexual response inhibition due to threats to performance failure (e.g., failure to maintain arousal). A second sexual inhibition factor (SIS2; 9 items) asks about sexual response inhibition due to threats of performance consequences (e.g., STI exposure). The SIS/SES has good test-retest reliability and convergent and discriminant validity (e.g., Graham, Sanders, & Millhausen, 2006).

Non-sexual psychometric measures

The *Gambling Quantity and Perceived Norms Scale* (GQPN; Neighbors, Lostutter, Larimer, & Takushi, 2002) is a 13-item survey that measures moderate gambling behavior, tailored to the relevance of gambling for a college student (i.e., financial restrictions, opinions about others' gambling behavior), and was used in the current study to measure frequency of gambling (Item 2). The *Fagerstrom Test for Nicotine Dependence* (FTND; Fagerstrom & Schneider, 1989) is a 6-item measure is a standard tool for assessing the physical intensity of addiction to nicotine. High scores indicate a greater level of nicotine dependence. The psychometric studies of the FTND are mixed (for a review, see de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009), but it

remains widely used in the literature. The *Alcohol Use Disorders Identification Test* (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) is a 10-item measure recommended by the World Health Organization as a brief screening instrument for the detection of harmful alcohol consumption. It assesses drinking frequency, intensity, symptoms of tolerance and dependence, and alcohol-related negative consequences over the past 12 months, and has high internal validity and test-retest reliability. The *Polydrug Use Questionnaire* is a 7-item measure that assesses the extent to which subjects have used a variety of drugs over the past 12 months. The format is based on that frequently used in the extant literature (e.g., Parrott, Sisk, & Turner, 2000).

Discounting tasks

Participants completed four different computerized discounting tasks measuring delay and probability discounting for hypothetical money and sexual activity after the researcher read a standardized script (see below). These tasks were similar to those used previously (Lawyer et al, 2010; Richards, Zhang, Mitchell, & de Wit, 1999). The order of monetary and sexual activity discounting tasks were counterbalanced. Within the outcome types the delay discounting task was completed first. Questions were administered by the computer program in a titrating procedure which based the quantity and content of future questions on the participant's previous responses until an indifference point was established at each delay or probability. See Table 2 for descriptive data regarding the discounting tasks.

Money delay discounting.

In this task, participants made a series of choices between a large amount of money (i.e., \$10) to be received after one of five different delay periods (i.e., 1 day, 1

week, 1 month, 6 months, 1 year) and a smaller amount of money (e.g., \$2) available immediately. For example, some subjects were presented with the question: “Would you rather have (a) \$1 now or (b) \$10 in 1 month?” In this task, the larger amount was held constant and the smaller amount of money was adjusted by the program until a value that represented the individual's indifference was arrived at for each of the delay periods. The indifference point refers to the current “value” of large amount of money after the delay period (e.g., \$10 in 180 days might have an immediate “value” of \$5).

Participants completed this task after a research assistant read verbatim the following instructions:

“I'm going to ask you to make some decision about which of two rewards you would prefer. One of the rewards will be available right now, and the other will only be available after you have waited for some period of time. For example, I might ask you to choose between \$550 delivered right now and \$800 delivered in two years. The choices you make are completely up to you. You will not receive any of the rewards that you choose, but we want you to make your decisions as though you were really going to get the rewards you choose.”

Money probability discounting.

In this task, participants made a series of questions about preferences for relatively small outcomes (e.g., \$1) available "for sure" and larger outcomes (i.e., \$10) available with one of several different probabilities (i.e., 95%, 75%, 50%, 25%, 10%). For example, some subjects were presented with the question: “Would you rather have (a) \$1 for sure or (b) \$10 with a 50% chance?” In this task, the larger amount was held constant and the smaller amount of money was adjusted by the program until a value that

represented the individual's indifference was arrived at for each of the probability values. The indifference point refers to the current “value” of large amount of money at each probability value (e.g., \$10 with a 50% chance might have a subjective value of \$3).

Participants completed this task after a research assistant read verbatim the following instructions:

“I’m going to ask you to make some decision about which of two rewards you would prefer. One of the rewards will be available for sure, and the other will only be available with some probability. For example, I might ask you to choose between \$300 delivered for sure and \$600 delivered with an 80% chance. The choices you make are completely up to you. You will not receive any of the rewards that you choose, but we want you to make your decisions as though you were really going to get the rewards you choose.”

Sexual outcomes delay discounting

In this task, participants made a series of choices between a large amount of sexual activity (30 minutes) to be received after one of five different delay periods (i.e., 1 day, 2 days, 1 week, 1 month, 6 months) and a smaller amount of sexual activity (e.g., 12 minutes) available immediately. For example, some subjects were presented with the question: "Would you rather have (a) 6 minutes of sexual activity now or (b) 30 minutes of sexual activity in 1 day?" In this task, the larger amount was held constant and the smaller amount of money was adjusted by the program until a value that represented the individual's indifference was arrived at for each of the delay periods. The indifference point refers to the current “value” of large amount of money after the delay period (e.g., 30 minutes of sexual activity in 48 hours might have an immediate "value" of 6 minutes).

Participants completed this task after a research assistant read verbatim the following instructions:

“In the task that follows, you will have the opportunity to choose between different amounts of sexual activity available immediately or after different delays. The test consists of questions such as the following: ‘Which do you prefer?: 9 minutes of sexual activity right now or 30 minutes of sexual activity in 1 week?.’ ‘Sexual activity’ means different things for different people, but you should answer each question in terms of whatever kind of sexual activity you personally find very appealing. You will not receive any of the rewards that you choose, but we want you to make your decisions as though you were really going to experience these outcomes.”

Sexual outcomes probability discounting

In this task, participants made a series of questions about preferences for relatively small outcomes (e.g., 6 minutes) available "for sure" and larger outcomes (30 minutes) available with one of several different probabilities (i.e., 95%, 75%, 50%, 25%, 10%). For example, some subjects were presented with the question: “Would you rather have (a) 6 minutes of sexual activity for sure or (b) 30 minutes with a 50% chance?” In this task, the larger amount was held constant and the smaller amount of money was adjusted by the program until a value that represented the individual's indifference was arrived at for each of the probability values. The indifference point refers to the current “value” of large amount of money at each probability value (e.g., 30 minutes with a 50% chance might have a subjective value of 10 minutes).

Participants completed this task after a research assistant read verbatim the

following instructions:

“I’m going to ask you to make some decision about which of two sexual outcomes you would prefer. One of the outcomes will be available for sure, and the other will only be available with some probability. For example, I might ask you to choose between 12 minutes of sexual activity for sure and 30 minutes with an 60% chance. The choices you make are completely up to you. You will not receive any of the sexual outcomes that you choose, but we want you to make your decisions as though you were really going to experience these outcomes.”

Procedure

Upon arriving at the laboratory, participants were led to a semi-private cubicle with a computer to read consent forms and then complete all discounting and self-report measures. The order of the monetary and sexual tasks was counterbalanced across participants, as was the order of the behavioral decision-making tasks and the self-report measures. After completion of the behavioral and self-report tasks, participants were thanked for their participation and debriefed about general aspects of the study upon request.

Data analysis

Identification of nonsystematic responders

Nonsystematic response patterns – those that deviate significantly from the expectation that the value of outcomes will diminish as a function of delay and probability – were identified using Johnson and Bickel’s (2008) algorithms. The first algorithm states that an individual’s indifference point for one delay or probability not be more than 10% (of the large amount, in this study 3 minutes or \$1) higher than their

responding on a larger delay or lower probability. The second algorithm states that an individual's indifference point for the first delay (i.e., 1 day) or greatest probability (i.e., 95%) not be less than 10% higher than their responding on the longest delay (i.e., 6 months) or lowest probability (i.e., 10%). The frequency of nonsystematic responders was used to describe the discounting patterns of the sample. Data from all participants were included in the analyses.

Individual discounting patterns

Individual discounting patterns were quantified in two ways. Individual rate of discounting was calculated by applying the hyperbolic decay function (Mazur, 1987) to individual indifference point data across tasks for delay (Equation 1) and probability (Equation 2) discounting tasks. Individual k - and h -values estimated by these functions served as one measure of discounting rate. Discounting also was quantified by measuring the area under the curve (AUC), which provides an atheoretical method for describing discounting patterns. AUC measures the area underneath each individual's discounting curve using a standard procedure (Myerson et al., 2001) that yields a value ranging from 0.0 to 1.0. In AUC analysis, smaller numbers represent higher (i.e., steeper) discounting rates.

Exploratory factor analysis

An exploratory factor analysis (EFA) was used to identify the latent factors comprising the self-report measures. This increases variability within the factors and decreases the risk of Type I error associated with multiple comparisons across individual questionnaires. The total scores from each of the self-report questionnaires were entered into a principal components EFA with varimax rotation. The EFA included nine scores

from seven psychometric measures (SSSS, SDI, SIS/SES, GQPN, AUDIT, FTND, and polydrug questionnaire). Results revealed that eight out of nine scores could be reduced to three latent factors (see Table 3); the GQPN did not sufficiently map onto any of the factors and was therefore excluded from further analysis. A second EFA without the GQPN (see Table 4) produced a KMO score of .67, indicating that the measures shared sufficient variance to be loaded onto different factors, while a Bartlett's test ($\chi^2 (36) = 252.33, p < .001$) indicated that the measures shared significant covariance, which suggests that they possessed good fit for dimension reduction through EFA. The SDI, SSSS, and SES loaded onto Factor 1, which was referred to as the "SexApp" (sexual approach) factor. The AUDIT, FTND, and polydrug questionnaire loaded onto Factor 2, which was dubbed the "NonSex" (non-sexual) factor. The SIS1 and SIS2 subscales of the SIS/SES loaded onto Factor 3, and was referred to as the "SexInh" (sexual inhibition) factor. Individual factor scores for each participant across each factor were calculated in SPSS and saved during analysis using the regression method. These factor scores were then used in regression analyses as criterion variables predicted by the different discounting tasks (see below).

Regression analysis

Study hypotheses were first tested by measuring bivariate relationships between each of the three factors (SexApp, NonSex, and SexInh) and individuals' discounting patterns as quantified by both rate of discounting (i.e., k and h) and AUC values for each of the four discounting tasks. Based on documented gender differences in both discounting and sexual self-report measures (Silverman, 2003), we conducted independent samples t -tests to determine whether there were gender differences across

the self-report measures (Table 1) and discounting tasks (Table 2). Following this analysis, regression analyses were performed to determine the extent to which each of the four discounting tasks predicted the three factors (Tables 5-10). Additionally, based on the fact that gender was significantly correlated with the dependent variables, and due to significant gender differences from several of the *t*-tests regarding both the self-report measures and the discounting tasks, gender was entered into the regression models as a covariate.

CHAPTER THREE

EXPERIMENT 1 RESULTS

Due to experimenter error, probability sexual discounting data for three participants were lost. Other data (all self-report measures and other discounting behavior) from these participants were included in all analyses.

Identification of nonsystematic responders

Out of the total sample of 102 participants, 34 responded in a nonsystematic fashion on one or more of the four discounting conditions, for a total of 50 (out of a possible 405) occurrences of nonsystematic responding across the four conditions. A binomial chi-square analysis of frequency revealed that participants responded nonsystematically more often on sexual versus money discounting tasks, for both delay ($\chi^2(1) = 30.61, p < .001$) and probability ($\chi^2(1) = 42.96, p < .001$). Data from all participants were included in data analyses.

Discounting across tasks

Median subjective values of each large outcome at a given delay (i.e., k -value) or probability (i.e., h -value) for monetary (Figure 1) and sexual (Figure 2) outcomes. As expected, the hyperbolic decay model (Mazur, 1987) provided a good fit to median group data across all four tasks ($R^2 > .92$ for all tasks). In all four conditions, the value of hypothetical money or sexual activity decreased as delay in days or odds against receiving the large outcome increased. Raw scores for k and h values were substantially skewed; log-10 transformations of these scores produced values that met acceptable levels of skewness and kurtosis.

Initial analysis revealed statistically significant correlations between sexual and

money delay AUC ($r = .29, p = .003$), as well as between sexual and money probability AUC ($r = .35, p < .001$). Statistically significant correlations were also found between sexual delay and probability ($r = .46, p < .001$) and money delay and probability ($r = .26, p = .008$) AUCs. Regarding log-10 transformed k and h values, correlations were significant between sexual delay and probability ($r = .46, p < .001$) and between sexual and money probability ($r = .34, p < .001$), but not between money delay and probability ($r = .19, p = .060$) or sexual and money delay ($r = .16, p = .115$). These findings provide partial support for the first study hypothesis, which predicted that sexual and money discounting tasks would be strongly correlated with one another. Consistent with previous research (e.g., Rachlin et al., 1991), the results also suggest that delay and probability tasks are closely related to one another.

Regarding gender and discounting data (Table 2), there was a trend toward men exhibiting lower (i.e., more impulsive) AUC values than women for sexual probability and sexual delay discounting. Regarding the relationship between gender and discounting k and h values, men also produced significantly higher (i.e., steeper) rates of sexual probability discounting and trended toward producing higher rates of sexual delay discounting. There were no significant relationships between gender and money discounting AUC or k and h values.

Regression analysis

A preliminary examination of the self-report data (Table 1) revealed significant associations between gender and both the SexApp factor and the SexInh factor, and a nonsignificant association between gender and the NonSex factor. Specifically, men endorsed more sexually excitatory and less sexually inhibitive behaviors than women on

most self-report measures, as well as greater substance use. Thus, gender was entered as a covariate in relevant analyses below.

To test the predictive role of discounting behavior on each of the three factors, twelve hierarchical (i.e., sequential) regression analyses were performed with gender entered as a covariate in the first step and AUC (Tables 5-7) and k and h values (Tables 8-10) for each of the four discounting tasks entered in the second step. Regarding AUC and the SexApp factor (Table 5), monetary delay, sexual probability, and sexual delay discounting behavior were significant predictors, and gender was a significant covariate. Neither gender nor any of the discounting AUC values were significant predictors of the NonSex factor (Table 6). Finally, money probability discounting AUC trended toward significantly predicting the SexInh factor, while gender was once again a significant covariate (Table 7). Only sexual delay discounting rate significantly predicted the SexApp factor (Table 8), while none of the tasks significantly predicted the NonSex factor (Table 9). Similar to findings with the AUC values, only the money probability discounting rate trended toward significantly predicting the SexInh factor (Table 10).

CHAPTER FOUR

EXPERIMENT 1 DISCUSSION

This study replicates previous research asserting that sexual outcomes, whether delayed or probabilistic, are discounted in a manner similar to monetary outcomes (Lawyer et al., 2010). The data for both sexual and money discounting patterns fit well with the hyperbolic decay model (Mazur, 1987) for both delayed and probabilistic outcomes. Additionally, individuals' AUC values for discounting for sexual outcomes are significantly correlated with those for money discounting tasks across both delays and probabilities. These findings replicate previous research (e.g., Estle et al., 2007) asserting that delay discounting possesses trans-commodity effects, and are consistent with other recent sexual discounting studies, which have sought to replicate and extend sexual discounting methodologies by operationalizing the sexual outcomes by frequency rather than duration (Jarmalowicz et al., in press), or by incorporating both rewarding and aversive components of sexual activity (Johnson & Bruner, 2012). These studies broadly support the use of the discounting paradigm in the larger study of impulsive sexual behavior.

This study also partially confirms the second hypothesis that discounting for sexual outcomes would better predict sex-related constructs than non-sexual constructs. Delay and probability discounting for sexual activity were associated with approach-related sex, but not with drug-related constructs. These findings are consistent with other studies identifying domain-specific discounting predictors of health-related outcomes. For example, Johnson and Bruner (2012) recently found that sexual discounting, but not monetary discounting, predicted self-reported sexual behavior in cocaine-dependent

adults. Such findings extend the commodity-specific effect of discounting to a sexual context, and indicate promise for future commodity-specific findings in a range of other health behavior contexts.

One study hypothesis that was not supported was the strength of the relationship between monetary discounting and non-sexual self-report measures. Neither delay nor probability discounting for monetary outcomes significantly predicted any of the self-report measures (i.e., AUDIT, FTND, or polydrug questionnaire) that loaded onto the non-sexual factor. One viable explanation for the aforementioned lack of findings regarding the relationship between monetary discounting and non-sexual self-report measures is that the sample's college-age substance use may have been underrepresented, as the mean AUDIT score in this sample (4.01) was substantially lower than national averages (7.45) collected from convenience college samples (Kokotailo, Egan, Gangnon, Brown, Mundt, & Fleming, 2004). Moreover, the sample was, on average, slightly older (mean age = 26.1) than typical convenience college samples, which may have also influenced the variability of certain self-report measures.

This study suggests that gender may play a significant role in the relationship between discounting and the self-report measures used here. Gender was significantly associated with both sexual discounting tasks, but not with either money discounting task, and it significantly predicted the factors associated with the sexual, but not the non-sexual, self-report measures. These results corroborate most research involving gender and discounting that suggest that men self-report more impulsive behavior and are more sensitive to delays of gratification than women (see Silverman, 2003, for a meta-analysis); more relevant to the current research, they also suggest that these gender

differences are domain-specific and manifest similarly across both self-report and discounting data.

Limitations

The current project has several limitations that merit attention. The sexual discounting task used in this study yielded nonsystematic response patterns more frequently than did the money tasks. One potential explanation for this discrepancy is that the delays are ranged differently on the sexual delay task (up to 180 days) than on the monetary delay task (up to 365 days). While such a difference could have led to ceiling or floor effects, it seems unlikely, given that the sexual probability task evoked similar rates of nonsystematic responding as the sexual delay task, despite being subjected to the same range of probabilities as the money probability task. Another possibility is that hypothetical sexual outcomes were not universally viewed as rewarding within the sample, as previous research in our lab suggests that some participants may respond to sexual outcomes as though they are punishing rather than rewarding (Lawyer, 2008). A third possibility is the sexual task, which requires participants to imagine one's "ideal sexual experience" and engage in abstract visualization, may add a distraction component not present in the money task.

Relatedly, given that money and sexual activity possess qualitatively different reinforcing properties, the conceptualization of sexual activity as a primary reinforcer may oversimplify its influence on human behavior as a voluntary act with both positive and negative consequences (many of which are both probabilistic and delayed). Even one's ideal sexual experience may have unconsidered and unpredictable negative consequences (e.g., STI, unwanted pregnancy), and thus individuals may differentially

discount hypothetical sexual activity based on their (positive and/or negative) sexual learning histories. Yet other factors, such as time since last sexual encounter (i.e., satiation), might also influence the magnitude of the reinforcing properties of hypothetical sexual activity. Some of these factors, such as an individual's sensitivity to the negative consequences of sexual activity, may also differ based on gender. Such considerations should be addressed in subsequent research involving sexual discounting.

Future directions

With specific regard to sexual outcomes, further research should aim to integrate alternative methods of the discounting task. Jarmalowicz and colleagues (in press) recently used a discounting task that quantified sexual outcomes in terms of frequency rather than by duration, and found that rates of sexual discounting were steeper in alcohol-dependent individuals than in non-dependent controls. Interestingly, results suggested that sexual discounting, but not monetary discounting, produced differential responding with regard to level of alcohol dependence. The current study's findings corroborate Jarmalowicz et al.'s findings, indicating that the sexual discounting task may be a better predictor of self-reported impulsive behavior than monetary discounting.

The current study found gender effects that approached or reached significance for sexual, but not money, discounting. This suggests that discounting may possess a domain-specific gender effect, such that discounting tasks involving different outcomes may differentially predict the magnitude of differences in responding between men and women. To this point, Tidwell and Eastwick (2013) recently examined gender differences in sexual impulse strength and sexual self-control, and found that men on average experience greater sexual arousal than women, but are not markedly better or

worse at controlling sexual impulses. Another study involving discounting and gender found that men and women discount monetary outcomes similarly under normal conditions, but that men are steeper discounters after viewing pictures of attractive women (Wilson & Daly, 2004). Thus, future research should assess the roles of discounting, sexual arousal, and sexual priming in the context of gender.

CHAPTER FIVE

EXPERIMENT 2 INTRODUCTION

Money discounting tasks are more prevalent in the literature due to their ease of administration and substitutability of hypothetical outcomes for real or potentially real ones (Lawyer et al., 2011), but domain-specific discounting tasks may better predict some health-related outcomes (Johnson & Bruner, 2012; Rasmussen et al., 2010). Likewise, findings from Experiment 1 suggest that sexual discounting tasks predict self-reported sexual behavior differently (and perhaps more accurately) than money discounting tasks. Therefore, some behavioral patterns may be best described using domain-specific, rather than general, measures of impulsive choice.

Traditional theories of personality (e.g., Costa & McCrae, 1992) typically view impulsivity as a personality trait reflected across contexts rather than a behavior pattern determined by context. Most discounting research has treated impulsivity similarly, using discounting behavior primarily as a predictor (i.e., independent variable) of real-world problem health behavior rather than examining how contextual manipulations can influence discounting patterns. However, discounting behavior acts as both a determinant and a consequence of drug use (for a review, see de Wit, 2009) and several studies make it clear that discounting behavior can be influenced by experimental controlled manipulation. Bickel et al. (2011) found that working memory training decreases rates of discounting among stimulant addicts (Bickel, Yi, Landes, Hill, & Baxter, 2011), and DeVoe, House, and Zhong (2013) recently reported steeper delay discounting patterns in individuals primed with thoughts about fast food, relative to thoughts about sit-down dining. Another study demonstrates that extraverted individuals,

relative to non-extraverts, become more sensitive to delay of gratification following positive mood induction (Hirsh, Guindon, Morisano, & Peterson, 2010). Finally, Hendrickson & Rasmussen (2013) recently found that a mindful eating training exercise (relative to control) decreases delay discounting for food, but not money. This suggests both that discounting is sensitive to environmental factors (such as learning), but that the effect may be commodity-specific.

Two studies suggest that exposure to sexual cues may influence impulsive choice, including discounting. Kim and Zauberman (in press) recently found that discounting for hypothetical money is influenced by sexual cues in heterosexual men, and that this effect is jointly due to an increased sensitivity to immediate reward and to an increased intolerance of delay. The authors also venture that these effects would potentially be more pronounced in discounting for non-monetary (i.e., “less psychologically distant”) outcomes. This study was in part inspired by an earlier study conducted by Wilson and Daly (2004), who found that individuals asked to rate photographs of attractive people exhibited greater (i.e., steeper) changes in discounting for hypothetical monetary rewards than individuals asked to rate photographs of unattractive people or photographs of cars. The latter study also found that men showed a significantly greater change in discounting behavior than did women, which suggests that, in addition to Experiment 1’s findings that men exhibit more impulsive sexual discounting behavior and self-reported sexual behavior, they may also be more sensitive to sexual priming.

While environmental factors appear to substantially influence delay discounting, it is not clear whether environmental factors differentially influence *domain-specific* patterns of impulsive choice. Loewenstein’s (1996) “visceral influences” hypothesis

purports that visceral factors, such as sexual desire, have several predictable influences on behavior, including a differential influence on impulsive choice for domain-relevant outcomes; he further argues that sexual arousal should increase impulsive choice for sexual outcomes relative to non-sexual outcomes. To date, though, no research has examined whether exposure to sexual cues leads to differential patterns of choice on domain-specific measures of delay discounting. Experiment 1's findings of a domain-specific effect of discounting for sexual outcomes suggests that discounting for sexual outcomes may be sensitive to environmental factors that might differentially influence impulsive choice for sexual versus non-sexual outcomes.

The current study aimed to replicate the domain-specific effect found in Experiment 1 and to determine whether participants primed with sexual, non-sexual, and neutral pictures yield differential patterns of discounting for sexual and non-sexual outcomes. Based on gender effects found by Wilson and Daly (2004), we recruited only male participants to maximize potential priming effects. The primary study hypotheses were: (1) delay discounting for sexual outcomes would share a significantly higher positive correlation with self-reported sexual behavior than would delay discounting for money, (2) delay discounting for sexual and monetary outcomes would both change as a function of priming (i.e., exposure to sexual and non-sexually exciting photographs would produce more impulsive discounting behavior than exposure to neutral photographs), and (3) delay discounting for sexual outcomes would change more in individuals primed with sexually exciting photographs (relative to those primed with non-sexually exciting or neutral photographs).

CHAPTER SIX

EXPERIMENT 2 METHOD

Participants

Sexually-active, heterosexual, adult male undergraduates ($N = 126$) participated in this study. Participants had a mean age of 23.98 ($SD = 5.56$), were primarily Caucasian ($n = 103$, 81.7%), Christian ($n = 77$, 61.1%), and had never been married ($n = 64$, 50.8%). All participants were either heterosexual ($n = 124$, 98.4%) or bisexual ($n = 2$, 1.6%). Data for all participants were included in statistical analyses. All participants were recruited from undergraduate psychology courses and received partial course credit for their participation.

Self-report measures

The self-report measures used for this experiment were similar in content and presentation to those used in Experiment 1. Regarding sexual measures, participants completed the *Sexual Desire Inventory* (SDI), the *Sexual Sensation Seeking Scale* (SSSS), and the *Sexual Inhibition / Excitation Scales* (SIS/SES). One additional sexual self-report measure, the *Sexual Risk Survey* (SRS; Turchik & Garske, 2009), was added to potentially increase the variance in discounting behavior accounted for by the sexual self-report measures. The 23-item SRS measures a broad range of risky sexual behaviors across five subscales. It has been shown to have good psychometric properties (test-retest reliability and internal consistency), as well as convergent and concurrent validity as demonstrated by the relationship it draws between reported number of sexual partners and history of infidelity (Turchik & Garske). In the current study, the SRS total score was calculated by creating ordinal values ranging from 0-4 for participants' responses for

each item based on the distribution of raw scores, per Turchik and Garske. Larger ordinal scores for each item represented higher frequencies of the corresponding self-reported behavior for that item.

Regarding non-sexual measures, the *Polydrug Questionnaire* and the *Alcohol Use Disorders Identification Test* (AUDIT) used in Experiment 1 were replaced by the *Drug Abuse Screening Test* (DAST; Skinner, 1982) in Experiment 2, since the latter offers a potential increase in variability between participants (i.e., is comprised of 31 items), has more refined psychometric properties, and is a valid measure of drug/alcohol use in undergraduate populations (Yudko, Lozhkina, & Fouts, 2007). As with Experiment 1, participants completed the *Fagerstrom Test for Nicotine Dependence* (FTND) and Item 2 from the *Gambling Quantity and Perceived Norms Scale* (GQPN), and also provided demographic and financial information.

Behavioral decision-making tasks

Monetary Choice Questionnaire (MCQ; Kirby, Petry, & Bickel, 1999)

Delay discounting for money was measured using an abridged version of the *Monetary Choice Questionnaire* (MCQ). In the original MCQ, participants make 27 choices between smaller immediate rewards (SIRs) and larger delayed rewards (LDRs); within the task, there are nine questions for each of three LDR size conditions (small, \$25-\$35; medium, \$50-\$60; and large, \$75-\$85). Participant response patterns are used to estimate an individual's rate of discounting (i.e., k -value) derived from the hyperbolic decay model (Mazur, 1987). The nine choices for each LDR size condition define ten "bins" of discounting rates, of which eight are bound between the choices while the other two are endpoints (that represent response patterns selecting entirely SIRs or LDRs).

Each LDR size condition produces a k -value that ranges from .00016 to .25. In the task, an individual's k -value is the discounting rate which falls between the two choices at which the greatest consistency of responding is found, identified as the point with the highest sum of lower-ranked (i.e., closer to 1) SIRs and higher-ranked (i.e., closer to 9) LDRs. If an individual's response pattern produces two values that yield equal response consistency, the geometric mean of the corresponding values represents that individual's k -value. The MCQ has since been validated by other researchers (Kirby & Petry, 2004; Dom, D'haene, Hulstijn, & Sabbe, 2006), and has been used extensively by researchers in the last decade.

In order to avoid potential fatigue effects, we used an abridged version (see Appendix 13) of the MCQ to measure discounting behavior both before and after photograph priming. Our MCQ consisted of the nine questions for the medium LDR size condition (\$50-\$60), and contained delays ranging from 7-160 days. In addition to the questions used from the original MCQ (Kirby et al., 1999), we developed and used an alternate version of the abridged MCQ (Appendix 14) to control for practice effects in our pretest-posttest procedure. The alternate form of the MCQ contained questions which were not identical to those in the standard form, but which produced identical k -values according to the hyperbolic decay model (Mazur, 1987). In a pilot study ($n = 15$), these tasks were shown to produce similar response patterns within respondents. Prior to completing each of these tasks, the following instructions were read to participants.

MCQ task instructions:

"I'm going to ask you to make some decision about which of two monetary rewards you would prefer. One of the rewards will be available right now, and the

other will only be available after you have waited for some period of time. For example, I might ask you to choose between \$5 delivered right now and \$10 delivered in a month. The choices you make are completely up to you. You will not receive any of the rewards that you choose, but we want you to make your decisions as though you were really going to get the rewards you choose."

Sexual Choice Questionnaire (SCQ)

The SCQ (see Appendices 15 & 16) combined aspects of the monetary discounting task used in the current study (i.e., MCQ) and the sexual discounting task used in Experiment 1. It consisted of 9 randomly ordered questions about which of two hypothetical sexual outcomes an individual would prefer (a smaller immediate reward, SIR, and a larger delayed reward, LDR). In the SCQ, ten "bins" of discounting rates determined potential k -values for participants, and individual k -values were measured as the "bin" value that corresponded with the most consistent pattern of responding. LDRs were based on duration of sexual encounter, and ranged from 24-36 minutes of one's "ideal" sexual activity. Applying the hyperbolic decay model (Mazur, 1987) to sexual outcomes, we created questions with delays which ranged from 1-55 days and, when contrasted with the aforementioned LDRs, led to a wide range of possible k -values (.00365 – 1.0). An alternate form of the SCQ was developed which contained different questions that produced similar k -values. These measures were pilot-tested ($n = 15$) and were found to produce similar response patterns within individuals. Prior to completing this task, the following instructions were read to participants.

SCQ task instructions:

"In the task that follows, you will have the opportunity to choose between

different amounts of sexual activity available after different delays. The test consists of questions such as the following: “Which do you prefer? 9 minutes of sexual activity right now or 30 minutes of sexual activity in 1 week?” “Sexual activity” means different things for different people, but you should answer each question in terms of whatever kind of sexual activity you personally find very appealing. You will not receive any of the rewards that you choose, but we want you to make your decisions as though you were really going to get the rewards you choose.”

Photograph rating (priming) task

After completing the first set of discounting tasks, participants viewed and rated photographs that were sexually exciting, non-sexually exciting, or neutral in nature. All photographs were selected from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2005), a commonly used stimulus set in priming research which contains pictures of a variety of situations, people, and objects that are standardized in terms of valence (i.e., the extent with which it has been found to make individuals feel “happy, pleased, satisfied, contented, or hopeful”) and arousal (i.e., the extent to which it has been found to make individuals feel “stimulated, excited, frenzied, jittery, wide-awake, or aroused”). Photographs in the sexually exciting condition contained clothed and unclothed women and couples in sexual situations (e.g., kissing), and contained high valence ($M = 7.25$) and arousal ($M = 6.44$) ratings. Non-sexually exciting photographs contained people engaging in activities such as skydiving, windsurfing, and riding on a roller coaster, and also contained high valence ($M = 7.32$) and arousal ($M = 6.33$) ratings. Neutral photographs contained inanimate objects such as towels, doorknobs, and file

cabinets, and contained relatively low valence ($M = 4.75$) and arousal ($M = 2.45$) ratings.

Participants were assigned randomly to view either sexually exciting, non-sexually exciting, or neutral pictures. Each condition required participants to view 25 photographs, presented randomly, and then rate them on a scale of 1-10 (1 = not appealing and 10 = very appealing). We chose to have participants rate rather than simply view) the photographs in order to increase their attention to each photograph and thus optimize the effect of priming.

Procedure

After consenting to participate, participants completed all measures using a computer program that presented questions to participants on a computer screen and downloaded their responses into an anonymous database. To control for order effects, tasks were counterbalanced in terms of order of completing self-report and behavioral tasks and in terms of sexual and money tasks after viewing pictures (see Appendix 12 for a visual depiction of the procedure). Within the discounting/photograph rating task set, participants were asked to complete the MCQ and the SCQ, then rate photographs from one of three conditions (i.e., sexually exciting, $n = 41$, non-sexually exciting, $n = 45$, or neutral, $n = 40$), and finally complete the MCQ and the SCQ again. After completing the second set of discounting tasks, participants were thanked, debriefed, and provided with course credit.

CHAPTER SEVEN

EXPERIMENT 2 RESULTS

Randomization and comparison of groups across measures and discounting tasks

A series of one-way ANOVAs with photograph condition as a three-level independent variable and the eight psychometric measures and two pre-priming discounting tasks as dependent variables revealed no significant differences across the three photograph conditions (See Table 11). This indicated that any detected effects in differences between pre- and post-priming would not be due to individuals differences in discounting and instead would be attributable to priming effects.

Factor analysis of self-report measures

In order to replicate the finding from Experiment 1 that discounting behavior is related to self-report measures in a domain-specific manner, the self-report measures were first loaded onto latent factor variables. A principal components exploratory factor analysis (EFA) with varimax rotation included nine scores from seven psychometric measures (SSSS, SDI, SIS/SES, SRS, GQPN, DAST, and FTND), and revealed that the eight of the nine scores could be reduced to three latent factors (See Table 12). Surprisingly, the SRS did not map onto the SexApp factor, and instead mapped onto the NonSex factor. Because this presented a potential confound to other data analyses, the SRS was analyzed separately from the three factors. The subsequent factor analysis (Table 13), which was conducted with three fixed factors, produced a KMO score (.69) and a Bartlett's test ($\chi^2(28) = 238.81, p < .001$) indicating that the measures shared sufficient variance to be loaded onto different factors and also shared significant covariance. These factors closely resembled those from Experiment 1, and were given

the same names; the SSSS, SDI, and SES loaded onto the SexApp factor, the GQPN, DAST and FTND loaded onto the NonSex factor, and the SIS1 and SIS2 loaded onto the SexInh factor.

Discounting across tasks

Participants' k -values were calculated in accordance with standardized scoring procedures for the MCQ (Kirby et al., 1999). Frequency plots of k -values for money and sexual activity revealed that individuals produced a range of k -values for the MCQ which were normally distributed (Figure 3), but that the SCQ may have produced a restricted range of k -values, given the high frequency of k -scores toward the "ceiling" of 1.0 (Figure 4).

Relationships between self-report measures and pre-priming discounting for money versus sexual activity

The factor scores and the SRS were then correlated with participants' discounting rates (see Table 14) obtained before the photograph priming task. Significant correlations were found between the SexApp factor and both money and sexual activity discounting. Neither discounting task was significantly correlated with the NonSex factor, the SexInh factor, or the SRS. Finally, the money and sexual discounting tasks significantly correlated with one another.

Comparison of discounting across pre- and post-priming conditions

After obtaining pre- and post-priming k -values for the MCQ and SCQ, two repeated-measures ANOVAs were conducted (one each for money and sexual discounting) to determine differences between pre- and post- measures of discounting, and their interactions with photo condition (see Figures 5 & 6). On the sexual

discounting task, there was no main effect, ($F(1,123) = 1.85, p = .176$), but there was a trend toward a significant interaction ($F(2, 123) = 2.62, p = .077$). On the money discounting task, there was no main effect ($F(1,123) = 1.26, p = .263$) or interaction ($F(2, 123) = 2.02, p = .137$).

Reliability analysis of discounting tasks

Spearman's rho reliability analyses indicated moderate reliability between alternate forms of the money and sexual activity discounting tasks. The reliability of the alternate forms of the MCQ ($r_s = .56, p < .001$) was relatively strong, but was quite low for the sexual discounting task ($r_s = .14, p = .392$). This suggests that participants' responses varied significantly between the two forms of the sexual activity discounting task.

CHAPTER EIGHT

EXPERIMENT 2 DISCUSSION

The purposes of this study were to (1) replicate findings from Experiment 1 concerning the differential prediction of domain-specific (i.e., sexual) outcomes using a behavioral measure of impulsive choice for monetary versus sexual outcomes, (2) replicate Wilson and Daly's (2004) findings regarding the effect of sexual priming on impulsive choice for money, and (3) determine if sexual priming would differentially impact impulsive choice for sexual outcomes.

Results from this study partially replicated those from Experiment 1, in that discounting for sexual outcomes was strongly associated with self-reported sex-related constructs. However, discounting for both sex and money discounting were significantly correlated with the "sexual approach" factor, while neither was significantly correlated with either of the other two factors. Contrary to the findings in Experiment 1, these results indicate no domain-specific relationship between discounting and sexual versus non-sexual outcomes. A potential explanation for this discrepancy is the differences in range between the discounting tasks in the two studies; both the MCQ and the SCQ consist of only nine items, whereas the discounting tasks used in Experiment 1 consist of 30-50 items apiece.

This study did not replicate Wilson and Daly's (2004) findings that priming participants with sexual pictures leads to steeper rates of discounting for money. In fact, there was actually a trend toward a reverse effect, in which the participants in the sexual photo condition trended toward becoming less impulsive on the second money discounting task, relative to the other conditions (Figure 5). There are several possible

explanations for this null finding. First, it is possible that Wilson and Daly's findings are spurious and sexual priming has no influence on impulsive choice, at least measured using delay discounting for money. However, other researchers have demonstrated that money discounting behavior is susceptible to priming in both sexual (Kim & Zauberman, 2012) and other specific contexts (e.g., DeVoe et al., 2013; Hirsh et al., 2010), suggesting that this is not likely. Another possibility is that the manipulation of sexual arousal in the current study was not sufficient to evoke a change in participant responding for monetary outcomes. Unfortunately, the current study did not conduct a manipulation check after priming, thus leaving us unable to determine the extent to which individuals were aroused in the sexual photograph condition.

Additionally, and contrary to the study hypothesis related to Loewenstein's (1996) visceral influences theory, there were no significant differences in sexual discounting behavior across the three photo conditions (Figure 6). One possible explanation for this null finding is that the SCQ may restrict the variability of responding between participants. Specifically, the reward amounts and delays used in the SCQ create a range of k -values (see Figure 4) that may not have captured the full range of individual choice patterns; the largest k -value for the SCQ was 1.0, while the MCQ has a maximum k -value of .25. We chose to create the SCQ with shorter delays (and thus higher k -values) to produce questions that might more adeptly capture the "visceral influences" that sexual priming have on decision-making, but may have inadvertently reduced the validity of the task in doing so. Limitations in variability may have also contributed to the poor reliability between alternate forms of the SCQ and thus reduced the study's statistical power in detecting hypothesized group differences. However, no

other research has directly examined the commodity-specific effect of priming on discounting behavior for sexual outcomes, thus leaving this issue currently unresolved.

Future research should consider validating alternate forms of the SCQ used here.

Given the preponderance of significant findings regarding priming effects on discounting for monetary outcomes, coupled with the dearth of research on the effects of priming on non-monetary discounting, it is worthwhile for future studies to further investigate the effect of priming on discounting behavior for different outcomes.

CHAPTER NINE

GENERAL DISCUSSION

Discounting research involving commodity-specific outcomes has received increased attention in the behavioral-economics literature in recent years. Commodity-specific discounting tasks have been demonstrated to produce response patterns that are described well using the hyperbolic decay model (Mazur, 1987), though they typically produce discounting rates which are steeper than those produced by tasks involving monetary outcomes (Green & Myerson, 2004; Estle et al., 2007). Findings from Experiment 1 and other recent research (e.g., Rasmussen et al., 2010) suggest that commodity-specific tasks may provide meaningful data in the context of human health problem behaviors. Similarly, Hendrickson & Rasmussen (2013) suggest that commodity-specific discounting tasks may also be differentially sensitive to psychological interventions targeting domain-specific impulsive choice. These findings regarding domain-specific discounting contribute to a growing research body that highlights the importance of discounting as an important behavioral process that underlies a variety of human health problem behaviors.

The findings reported here challenge the view that behavior is determined predominantly by stable personality traits, as they suggest that contextual factors such as commodity type influence decision-making in a manner that corresponds with an individual's self-reported behavior related to that commodity. The current study suggests that discounting is not a stable behavior pattern across domains and that discounting for sexual activity predicts self-reported real-world sexual outcomes significantly better than money discounting tasks.

The role of the influence of emotional priming on domain-specific discounting patterns remains a potentially fruitful focus for future research. Our failure to replicate findings reported by Wilson and Daly (2004) and others (Kim & Zauberman, 2012; DeVoe et al., 2013; Hirsh et al., 2010) may indicate methodological limitations associated with our tasks. Future research involving the environmental manipulation of methodologically-sound commodity-specific discounting tasks may produce changes in discounting rates which are similar to those documented for priming and money discounting.

Perhaps the greatest challenge in laboratory decision-making tasks is creating behavioral measures that are simultaneously internally and externally valid. Some researchers (e.g., Johnson & Bruner, 2012) have addressed this issue as it pertains to sexual discounting by creating tasks that measure impulsive choice in the context of high or low risk (i.e., probability of contracting an STI). Future research regarding discounting for sexual as well as other non-monetary outcomes (e.g., food, alcohol and other substances) should further attempt to incorporate both rewarding and punishing contingencies into commodity-specific discounting tasks.

Commodity-specific discounting research, in just over a decade, has already increased our ability to accurately predict human health behaviors. Ironically, given the purported utility of discounting for commodity-specific outcomes (over that for monetary outcomes), one of the challenges we now face is to continue to modify and create measures that are more internally and externally valid. The current study contributes systematic replications as well as novel methods and findings to the sexual discounting literature. Future research projects should aim to further synthesize varying

methodologies to increase external validity.

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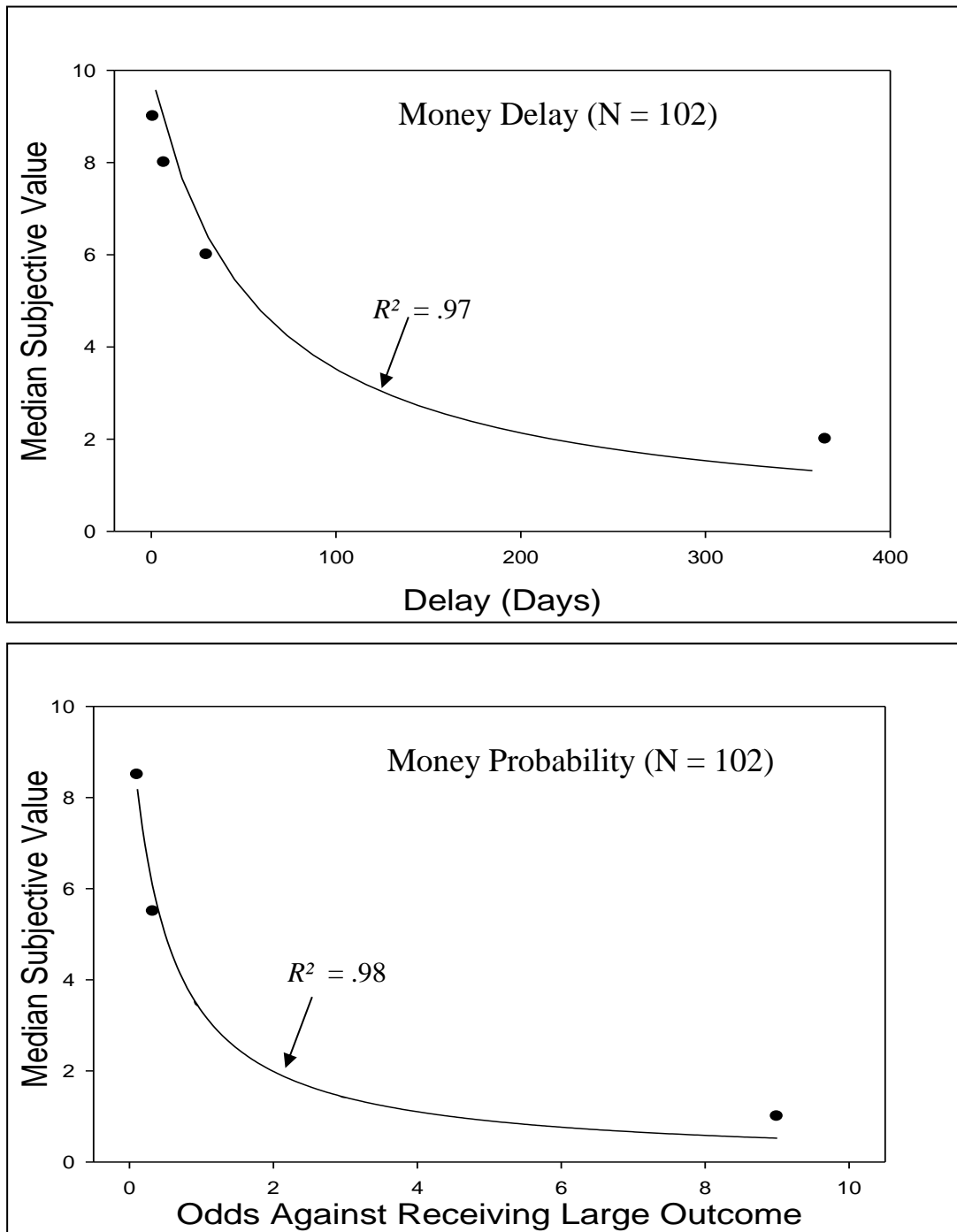
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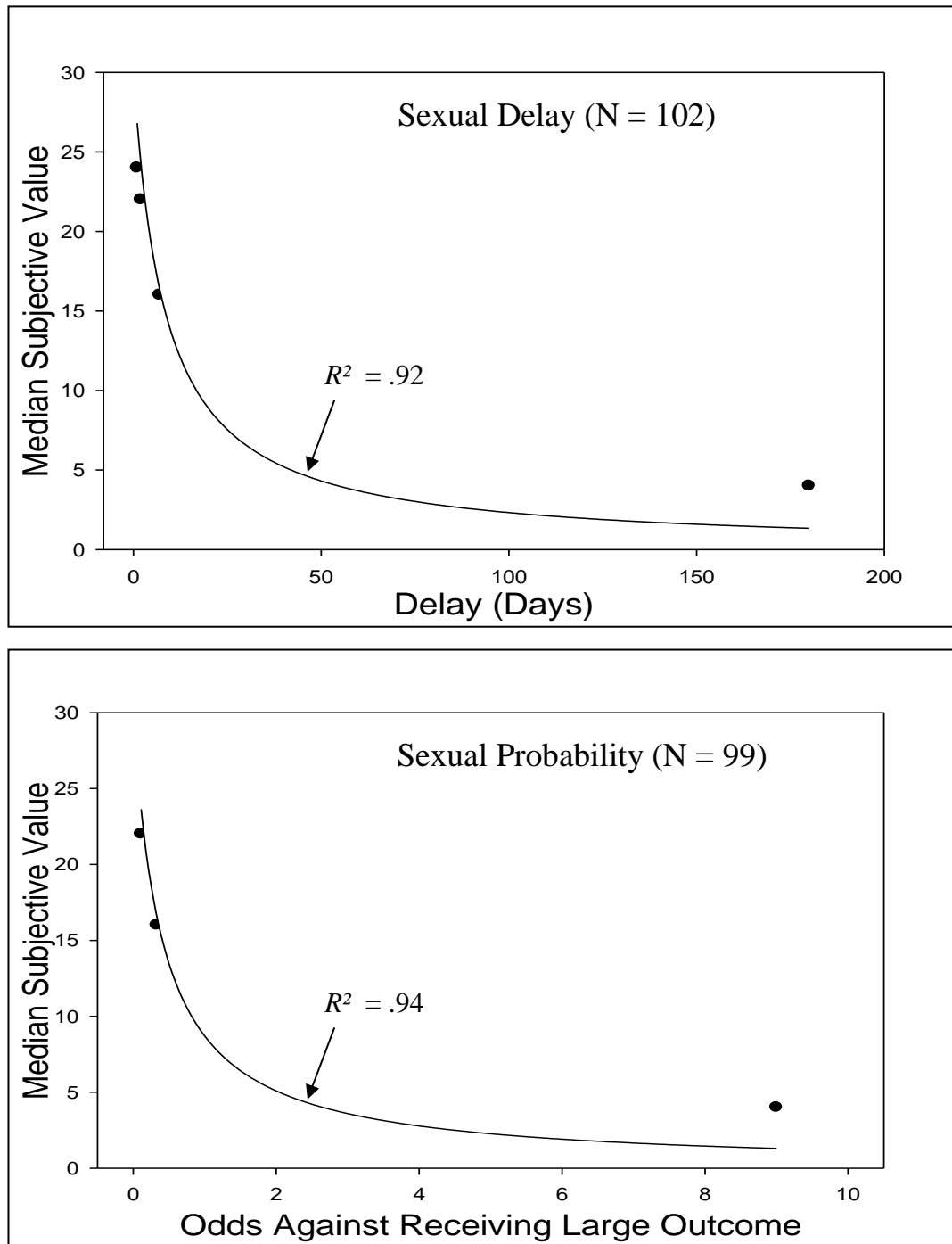
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Figure 1



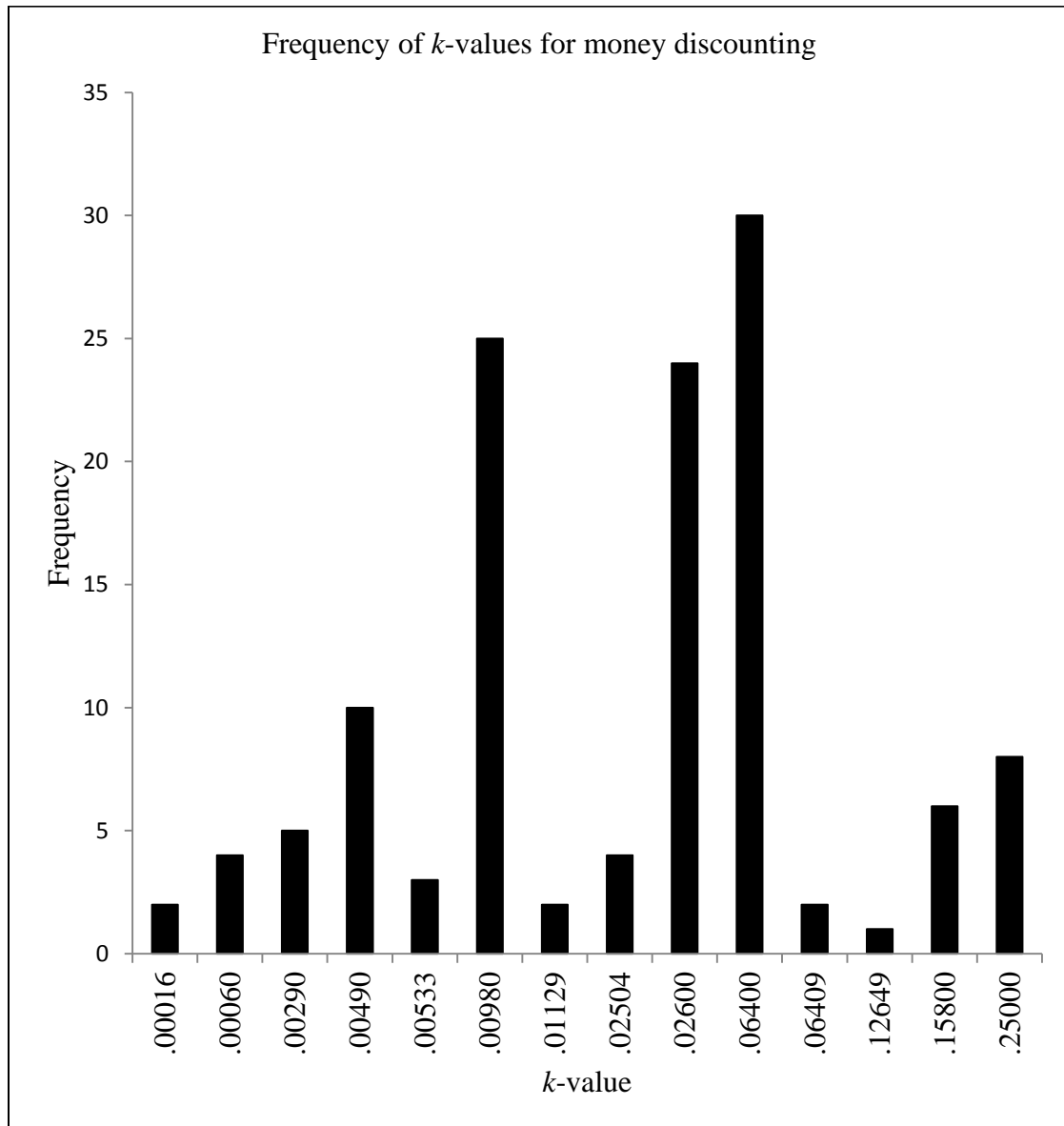
Experiment 1 money discounting curves. Median subjective values for delay (top panel) and probability (bottom panel) discounting for money. Fit lines represent best fit of the hyperbolic decay model.

Figure 2



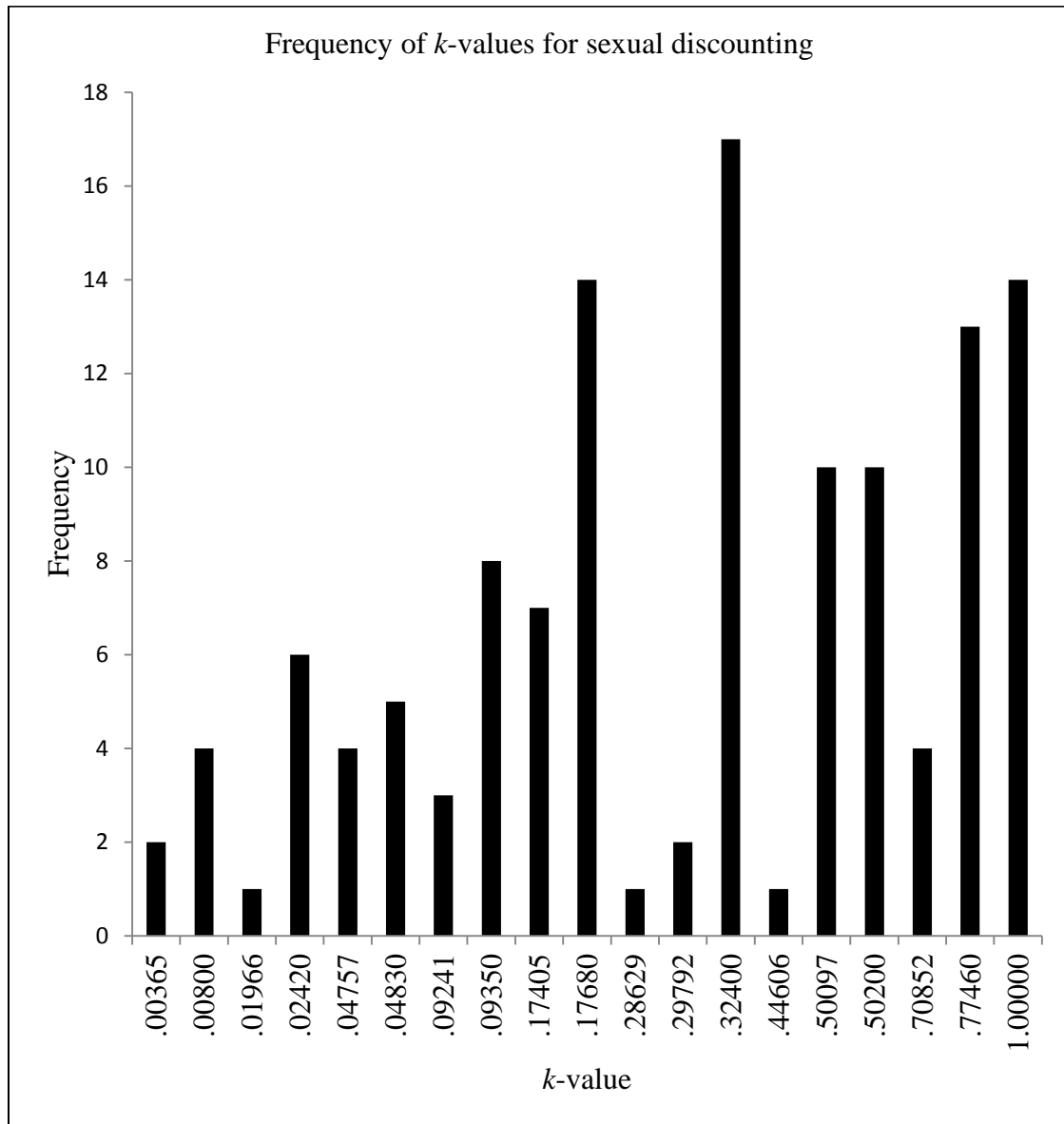
Experiment 1 sexual discounting curves. Median subjective values for delay (top panel) and probability (bottom panel) discounting for sexual outcomes. Fit lines represent best fit of the hyperbolic decay model.

Figure 3



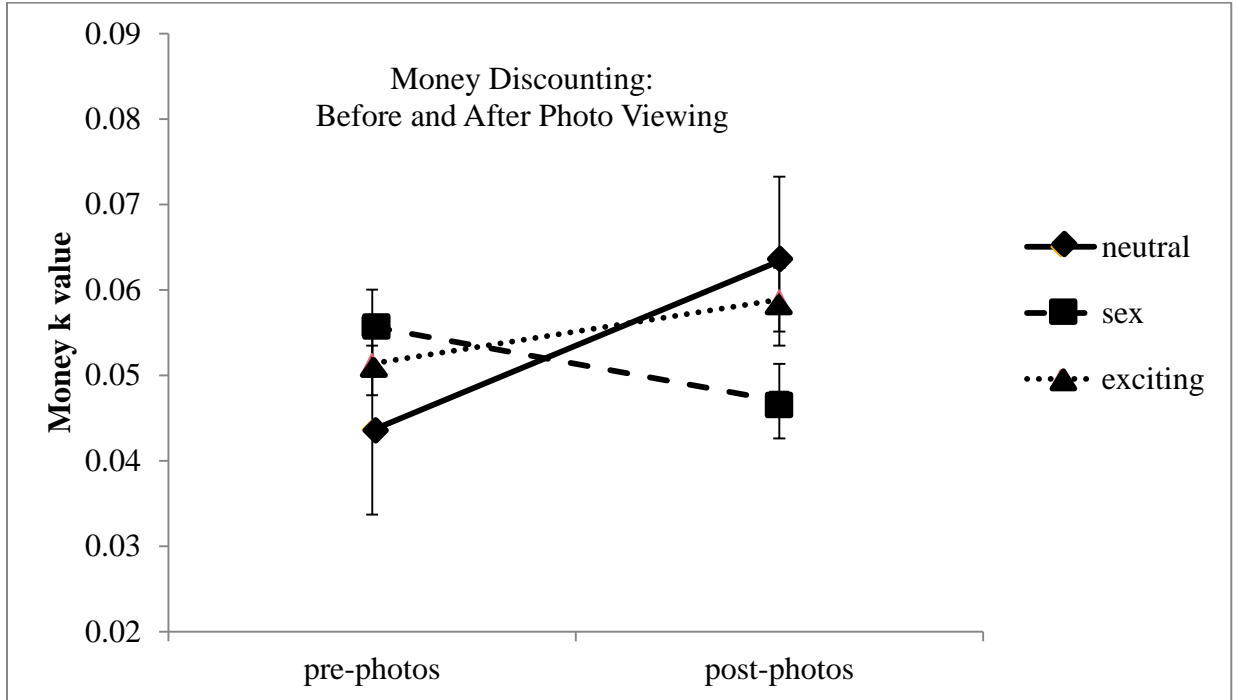
Experiment 2 frequency plot of k values for monetary outcomes before priming.

Figure 4



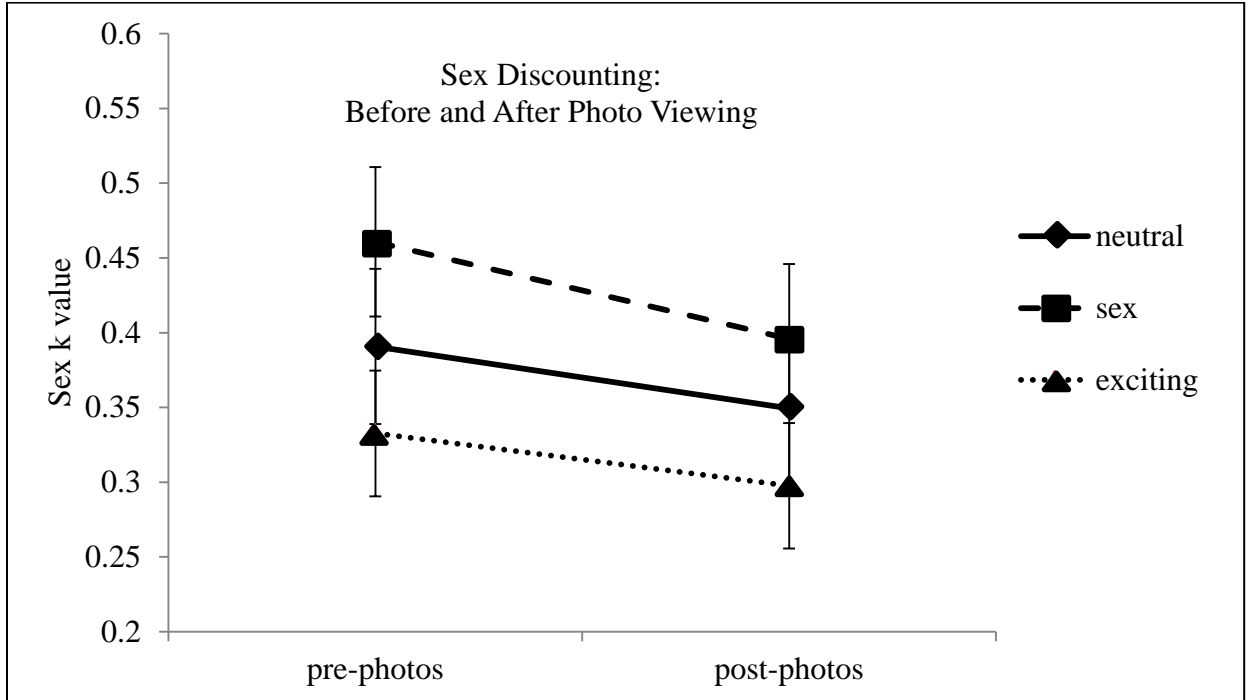
Experiment 2 frequency plot of k values for sexual outcomes before priming.

Figure 5



Experiment 2 change in k -value for money. Mean k -values for money discounting are plotted on the y-axis, with within-participant condition (pre- and post-priming) plotted on the x-axis, and between-participant condition (photograph rating content) represented by different shapes and lines; diamond = neutral ($n = 40$), square = sexual ($n = 41$), triangle = non-sexually exciting ($n = 45$). Error bars represent standard error of the mean (SEM) for participants' k -values in each condition pre- and post-priming.

Figure 6



Experiment 2 change in k -value for sexual outcomes. Mean k -values for discounting for sexual outcomes are plotted on the y-axis, with within-participant condition (pre- and post-priming) plotted on the x-axis, and between-participant condition (photograph rating content) represented by different shapes; diamond = neutral ($n = 40$), square = sexual ($n = 41$), triangle = non-sexually exciting ($n = 45$). Error bars represent standard error of the mean (SEM) for participants' k -values in each condition pre- and post-priming.

Table 1

Experiment 1 gender comparison of mean (SD) scores for psychometric measures and latent variables

	Total (N = 102)	Women (n = 65)	Men (n = 37)	<i>t</i>	Sig.
AUDIT (SD)	4.01 (4.15)	3.42 (3.18)	5.03 (5.37)	1.667	.102
Polydrug Use (SD)	8.75 (3.15)	8.15 (1.78)	9.78 (4.54)	2.096	.042
FTND (SD)	1.06 (2.25)	1.06 (2.30)	1.05 (2.19)	-.016	.987
GQPN (SD)	2.14 (1.49)	1.88 (1.28)	2.59 (1.72)	2.209	.031
SDI (SD)	69.13 (17.09)	64.95 (16.86)	76.49 (15.06)	3.449	.001
SSSS (SD)	20.39 (5.28)	18.49 (4.28)	23.73 (5.27)	5.455	.000
SES (SD)	49.83 (9.61)	46.91 (7.91)	54.99 (10.25)	4.444	.000
SIS1 (SD)	29.54 (6.06)	31.18 (5.11)	26.65 (6.58)	-3.878	.000
SIS2 (SD)	30.79 (5.20)	32.82 (4.22)	27.24 (4.89)	-6.049	.000
SexApp	0 (1.00)	-.29 (.89)	.50 (.99)	4.113	.000
NonSex	0 (1.00)	-.11 (.78)	.20 (1.29)	1.319	.193
SexInh	0 (1.00)	.35 (.79)	-.61 (1.05)	-5.266	.000

AUDIT – Alcohol Use Disorders Identification Test; FTND – Fagerstrom Test for Nicotine Dependence; GQPN – Gambling Quantity and Perceived Norms Scale; SDI – Sexual Desire Inventory; SSSS – Sexual Sensation Seeking Scale; SES – Sexual Excitation Scale; SIS1 – Sexual Inhibition Scale 1; SIS2 – Sexual Inhibition Scale 2; SexApp – Sexual Approach Factor; NonSex – Non-Sexual Factor; SexInh – Sexual Inhibition Factor

Table 2

Experiment 1 gender comparison of mean (SD) scores for discounting outcomes

	Total (N = 102)	Women (n = 65)	Men (n = 37)	<i>t</i>	Sig.
MPD AUC	.25 (.15)	.23 (.13)	.27 (.18)	1.038	.302
MDD AUC	.39 (.24)	.40 (.25)	.37 (.22)	-0.765	.446
SPD AUC	.25 (.18)	.27 (.18)	.20 (.16)	-1.883	.063
SDD AUC	.38 (.22)	.41 (.22)	.33 (.21)	-1.920	.058
MPD <i>h</i>	.27 (.49)	.31 (.45)	.19 (.56)	-1.207	.230
MDD <i>k</i>	-1.69 (.92)	-1.78 (.92)	-1.54 (.91)	1.267	.208
SPD <i>h</i>	-1.26 (1.54)	-1.51 (1.58)	-.83 (1.37)	2.208	.030
SDD <i>k</i>	-.96 (.92)	-1.09 (.91)	-.75 (.90)	1.853	.067

MPD AUC – Monetary Probability Discounting Area Under the Curve; MDD AUC – Monetary Delay Discounting Area Under the Curve; SPD AUC – Sexual Probability Discounting Area Under the Curve; SDD AUC – Sexual Delay Discounting Area Under the Curve; MPD *h* – Monetary Probability Discounting (*h*) log-10 transformed value; MDD *k* – Monetary Delay Discounting (*k*) log-10 transformed value; SPD *h* – Sexual Probability Discounting (*h*) log-10 transformed value; SDD *k* – Sexual Delay Discounting (*k*) log-10 transformed value

Table 3

Experiment 1 factor loadings of psychometric measures (including GQPN)

	Factor 1	Factor 2	Factor 3
SES	.897	.060	-.011
SDI	.883	.054	-.086
SSSS	.824	.199	-.259
PolyD	.152	.785	-.136
AUDIT	.094	.756	-.106
FTND	.124	.637	.407
GQPN	-.006	.469	-.109
SIS1	-.111	-.014	.789
SIS2	-.163	-.225	.767

SES – Sexual Excitation Scale; SDI – Sexual Desire Inventory; SSSS – Sexual Sensation Seeking Scale; PolyD – Polydrug Questionnaire; AUDIT – Alcohol Use Disorders Identification Test; FTND – Fagerstrom Test for Nicotine Dependence; GQPN – Gambling Quantity and Perceived Norms Scale; SIS1 – Sexual Inhibition Scale 1; SIS2 – Sexual Inhibition Scale 2

Table 4

Adjusted Experiment 1 factor loadings of psychometric measures (without GQPN)

	Factor 1	Factor 2	Factor 3
SES	.902	.064	-.015
SDI	.885	.055	-.091
SSSS	.810	.222	-.283
PolyD	.111	.837	-.205
AUDIT	.072	.762	-.158
FTND	.114	.661	.366
SIS1	-.099	.015	.795
SIS2	-.165	-.157	.773

SES – Sexual Excitation Scale; SDI – Sexual Desire Inventory; SSSS – Sexual Sensation Seeking Scale; PolyD – Polydrug Questionnaire; AUDIT – Alcohol Use Disorders Identification Test; FTND – Fagerstrom Test for Nicotine Dependence; GQPN – Gambling Quantity and Perceived Norms Scale; SIS1 – Sexual Inhibition Scale 1; SIS2 – Sexual Inhibition Scale 2

Table 5

Experiment 1 regression coefficients associated with AUC estimates and gender predicting the SexApp factor

Predictors	b	SE	β	<i>t</i>	<i>p</i>	R ²
Gender (Step 1)	-.787	.191	-.380	-4.113	.000	.145
MPD AUC (Step 2)	-.934	.618	-.140	-1.510	.134	.164
Gender (Step 1)	-.787	.191	-.380	-4.113	.000	.145
MDD AUC (Step 2)	-.709	.378	-.172	-1.874	.064	.174
Gender (Step 1)	-.767	.195	-.371	-3.940	.000	.138
SPD AUC (Step 2)	-1.487	.529	-.261	-2.813	.006	.204
Gender (Step 1)	-.787	.191	-.380	-4.113	.000	.145
SDD AUC (Step 2)	-1.121	.415	-.247	-2.699	.008	.203

MPD AUC – Monetary Probability Discounting Area Under the Curve; MDD AUC – Monetary Delay Discounting Area Under the Curve; SPD AUC – Sexual Probability Discounting Area Under the Curve; SDD AUC – Sexual Delay Discounting Area Under the Curve

Table 6

Experiment 1 regression coefficients associated with AUC estimates and gender predicting the NonSex factor

Predictors	b	SE	β	<i>t</i>	<i>p</i>	R ²
Gender (Step 1)	-.308	.205	-.149	-1.504	.136	.022
MPD AUC (Step 2)	.393	.668	.059	.589	.557	.026
Gender (Step 1)	-.308	.205	-.149	-1.504	.136	.022
MDD AUC (Step 2)	.345	.410	.084	.842	.402	.029
Gender (Step 1)	-.299	.208	-.144	-1.433	.155	.021
SPD AUC (Step 2)	.016	.589	.003	.027	.978	.021
Gender (Step 1)	-.308	.205	-.149	-1.504	.136	.022
SDD AUC (Step 2)	.308	.459	.068	.672	.503	.027

MPD AUC – Monetary Probability Discounting Area Under the Curve; MDD AUC – Monetary Delay Discounting Area Under the Curve; SPD AUC – Sexual Probability Discounting Area Under the Curve; SDD AUC – Sexual Delay Discounting Area Under the Curve

Table 7

Experiment 1 regression coefficients associated with AUC estimates and gender predicting the SexInh factor

Predictors	b	SE	β	<i>t</i>	<i>p</i>	R ²
Gender (Step 1)	.964	.183	.466	5.266	.000	.217
MPD AUC (Step 2)	1.019	.589	.152	1.729	.087	.240
Gender (Step 1)	.964	.183	.466	5.266	.000	.217
MDD AUC (Step 2)	.231	.367	.056	.629	.531	.220
Gender (Step 1)	.960	.184	.467	5.203	.000	.218
SPD AUC (Step 2)	.565	.518	.100	1.092	.278	.228
Gender (Step 1)	.964	.183	.466	5.266	.000	.217
SDD AUC (Step 2)	.058	.412	.013	.141	.888	.217

MPD AUC – Monetary Probability Discounting Area Under the Curve; MDD AUC – Monetary Delay Discounting Area Under the Curve; SPD AUC – Sexual Probability Discounting Area Under the Curve; SDD AUC – Sexual Delay Discounting Area Under the Curve

Table 8

Experiment 1 regression coefficients associated with log-10 transformed k and h estimates and gender predicting the SexApp factor

Predictors	b	SE	β	t	p	R ²
Gender (Step 1)	-.787	.191	-.380	-4.113	.000	.145
MPD h (Step 2)	.332	.188	.163	1.769	.080	.171
Gender (Step 1)	-.787	.191	-.380	-4.113	.000	.145
MDD k (Step 2)	.077	.101	.071	.761	.449	.150
Gender (Step 1)	-.787	.191	-.380	-4.113	.000	.145
SPD h (Step 2)	.094	.061	.144	1.530	.129	.164
Gender (Step 1)	-.787	.191	-.380	-4.113	.000	.145
SDD k (Step 2)	.221	.101	.203	2.200	.030	.185

MPD h – Monetary Probability Discounting (h); MDD k – Monetary Delay Discounting (k); SPD h – Sexual Probability Discounting (h); SDD k – Sexual Delay Discounting (k)

Table 9

Experiment 1 regression coefficients associated with log-10 transformed k and h estimates and gender predicting the NonSex factor

Predictors	b	SE	β	t	p	R ²
Gender (Step 1)	-.308	.205	-.149	-1.504	.136	.022
MPD h (Step 2)	-.136	.203	-.067	-.669	.505	.027
Gender (Step 1)	-.308	.205	-.149	-1.504	.136	.022
MDD k (Step 2)	-.093	.108	-.086	-.862	.391	.029
Gender (Step 1)	-.308	.205	-.149	-1.504	.136	.022
SPD h (Step 2)	-.008	.066	-.012	-.117	.907	.022
Gender (Step 1)	-.308	.205	-.149	-1.504	.136	.022
SDD k (Step 2)	-.036	.110	-.033	-.330	.742	.023

MPD h – Monetary Probability Discounting (h); MDD k – Monetary Delay Discounting (k); SPD h – Sexual Probability Discounting (h); SDD k – Sexual Delay Discounting (k)

Table 10

Experiment 1 regression coefficients associated with log-10 transformed k and h estimates and gender predicting the SexInh factor

Predictors	b	SE	β	t	p	R ²
Gender (Step 1)	.964	.183	.466	5.266	.000	.217
MPD h (Step 2)	-.353	.179	-.173	-1.974	.051	.247
Gender (Step 1)	.964	.183	.466	5.266	.000	.217
MDD k (Step 2)	-.131	.096	-.120	-1.355	.178	.231
Gender (Step 1)	.964	.183	.466	5.266	.000	.217
SPD h (Step 2)	-.091	.059	-.140	-1.555	.123	.236
Gender (Step 1)	.964	.183	.466	5.266	.000	.217
SDD k (Step 2)	-.049	.098	-.045	-.501	.618	.219

MPD h – Monetary Probability Discounting (h); MDD k – Monetary Delay Discounting (k); SPD h – Sexual Probability Discounting (h); SDD k – Sexual Delay Discounting (k)

Table 11

Experiment 2 comparison of mean (SD) scores for psychometric measures and pre-priming discounting tasks by photograph condition

Measure	All Subjects (N = 126)	Neutral (n = 40)	Sexual (n = 41)	Non-Sexual (n = 45)	F (2, 123)	<i>p</i>
DAST	6.53 (5.95)	7.50 (5.38)	8.07 (5.47)	7.82 (6.34)	.100	.905
FTND	.44 (1.38)	.70 (1.95)	.12 (.64)	.49 (1.24)	1.844	.163
GQPN	2.13 (1.50)	2.25 (1.71)	2.15 (1.41)	2.02 (1.42)	.242	.786
SDI	75.25 (13.85)	74.32 (12.01)	76.37 (15.29)	75.07 (14.25)	.223	.800
SSSS	23.18 (4.43)	23.23 (4.32)	23.22 (4.12)	23.11 (4.88)	.009	.991
SES	51.89 (9.08)	51.15 (8.40)	53.68 (10.14)	50.91 (8.59)	1.197	.306
SIS1	28.03 (5.33)	27.45 (4.08)	28.78 (6.53)	27.87 (5.13)	.661	.518
SIS2	28.27 (4.25)	28.70 (4.77)	27.93 (4.23)	28.20 (3.80)	.342	.711
SRS	18.17 (11.88)	18.50 (11.20)	16.12 (11.62)	19.73 (12.67)	1.014	.366
Money <i>k</i>	.049 (.06)	.041 (.05)	.055 (.07)	.051 (.07)	.497	.610
Sex <i>k</i>	.390 (.32)	.385 (.31)	.460 (.33)	.331 (.30)	1.792	.171

DAST – Drug Abuse Screening Test; FTND – Fagerstrom Test for Nicotine Dependence; GQPN – Gambling Quantity and Perceived Norms Scale; SDI – Sexual Desire Inventory; SSSS – Sexual Sensation Seeking Scale; SES – Sexual Excitation Scale; SIS1 – Sexual Inhibition Scale 1; SIS2 – Sexual Inhibition Scale 2; SRS – Sexual Risk Survey; Money *k* – *k*-value for pre-priming money discounting task; Sex *k* – *k*-value for pre-priming sexual outcomes discounting task

Table 12

Experiment 2 factor loadings of psychometric measures (including SRS)

	Factor 1	Factor 2	Factor 3
SDI	.894	.102	.061
SES	.868	.025	.090
SSSS	.738	.399	-.151
DAST	.229	.744	.090
GQPN	-.116	.718	.076
SRS	.231	.604	-.248
FTND	.152	.532	-.197
SIS1	.215	.093	.808
SIS2	-.134	-.221	.751

SDI – Sexual Desire Inventory; SES – Sexual Excitation Scale; SSSS – Sexual Sensation Seeking Scale; DAST – Drug Abuse Screening Test; GQPN – Gambling Quantity and Perceived Norms Scale; SRS – Sexual Risk Survey; FTND – Fagerstrom Test for Nicotine Dependence; SIS1 – Sexual Inhibition Scale 1; SIS2 – Sexual Inhibition Scale 2

Table 13

Adjusted Experiment 2 factor loadings of psychometric measures (without SRS)

	Factor 1	Factor 2	Factor 3
SDI	.899	.056	.067
SES	.868	.020	.082
SSSS	.758	.337	-.151
DAST	.257	.796	.036
GQPN	-.074	.699	.044
FTND	.165	.585	-.238
SIS1	.213	.106	.811
SIS2	-.153	-.193	.768

SDI – Sexual Desire Inventory; SES – Sexual Excitation Scale; SSSS – Sexual Sensation Seeking Scale; DAST – Drug Abuse Screening Test; GQPN – Gambling Quantity and Perceived Norms Scale; SRS – Sexual Risk Survey; FTND – Fagerstrom Test for Nicotine Dependence; SIS1 – Sexual Inhibition Scale 1; SIS2 – Sexual Inhibition Scale 2

Table 14

Experiment 2 correlation matrix of pre-priming discounting data and psychometric measures

	Money <i>k</i>	Sex <i>k</i>	SexApp	NonSex	SexInh	SRS
Money <i>k</i>	1					
Sex <i>k</i>	.29**	1				
SexApp	.19*	.27**	1			
NonSex	-.11	-.04	.00	1		
SexInh	-.09	-.10	.00	.00	1	
SRS	-.04	-.03	.23**	.60**	-.25**	1

* - $p < .05$; ** - $p < .01$; Money *k* – discounting *k*-value for monetary outcomes before photograph priming condition (i.e., baseline *k*-value); Sex *k* – discounting *k*-value for sexual outcomes before photograph priming condition; SexApp – Sexual Approach Factor; NonSex – Non-Sexual Factor; SexInh – Sexual Inhibition Factor; SRS – Sexual Risk Survey

Appendices

APPENDIX A: EXPERIMENT 1 CONSENT FOR RESEARCH PARTICIPATION

Idaho State University
Human Subjects Committee

Electronic Informed Consent Form for Non-Medical Research

CONSENT TO PARTICIPATE IN RESEARCH

Stimulus Specificity in Delay and Probability Discounting

You are asked to volunteer for a research study conducted by Fritz Schoepflin and Steven R. Lawyer, Ph.D., (208-282-2142), from the Department of Psychology at Idaho State University. You have been asked to participate in this research because you are at least 18 years old and report that you are sexually active. Your participation in this research is voluntary. You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

1. PURPOSE OF THE STUDY

The purpose is to examine how different stimuli affect decision-making patterns regarding money and sexual activity.

2. PROCEDURES

If you volunteer to participate in this study, we will ask you to do the following things:

- I. Questionnaires: You will be asked to electronically sign this consent form and complete several brief self-report measures on a computer.
- II. Decision-making tasks: You will complete two behavioral choice tasks in which you will answer questions about your preference for different outcomes.
- III. Duration: Participation in the study will involve 45-60 minutes of your time.

3. POTENTIAL RISKS AND DISCOMFORTS

You may experience some discomfort answering personal questions, such as about past drug use and sexual behaviors, though this discomfort is not anticipated to be significant.

4. ANTICIPATED BENEFITS TO SUBJECT

There are no tangible benefits to you for your participation.

5. ANTICIPATED BENEFITS TO SOCIETY

Results of this research will be used to better understand how we measure the behavioral processes associated with a variety of social health problem behaviors.

6. ALTERNATIVES TO PARTICIPATION

An alternative is to not participate in the study.

7. PAYMENT FOR PARTICIPATION

You will be rewarded one SONA credit for each half-hour, or part thereof, of participation. If you choose to withdraw your participation for any reason, you will be compensated for however much time you spent on the study. We anticipate that this study will take approximately 45 minutes to complete.

8. FINANCIAL OBLIGATIONS

There are no financial obligations to you in the study.

9. EMERGENCY CARE AND COMPENSATION FOR INJURY

There is no anticipated risk of injury associated with this study. Idaho State University does not provide any other form of compensation for injury. No other compensation is available.

10. PRIVACY AND CONFIDENTIALITY

To protect your privacy, the information you provide to us is anonymous and will never be connected with your name. All research-related information will be identified with only a subject number. No information about you, or provided by you during the research, can be disclosed since only subject numbers are used.

11. PARTICIPATION AND WITHDRAWAL

Your participation in this study is VOLUNTARY. If you choose not to participate in the study, this will not affect any benefits from ISU to which you are entitled. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time. You should contact the investigator in charge of this study if you decide to do this.

12. WITHDRAWAL OF PARTICIPATION BY THE INVESTIGATOR

The investigator may stop your participation in this study at any time if circumstances arise which warrant doing so. The investigators, Fritz Schoepflin and Steven R. Lawyer, Ph.D., will make the decision and let you know if it is not possible for you to continue. You may also be forced to withdraw if you do not follow the investigator's instructions.

If you must drop out because the investigator asks you to (rather than because you have decided on your own to withdraw), for any reason other than not complying with the investigator's instructions, you will be compensated with research credits according to the procedures described above.

13. IDENTIFICATION OF INVESTIGATORS

If you have any questions about the research or your participation in the study, please feel free to contact:

Steven R. Lawyer, PhD, Garrison Hall, 921 S. 8th Ave, Stop 8112, Idaho State University, Pocatello, ID 83209-8112, (208) 282-2142

14. RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have any questions regarding your rights as a research subject, you may contact the Idaho State University Human Subjects Committee at (208) 282-2179.

INDICATION OF CONSENT BY RESEARCH SUBJECT
--

I have read (or someone has read to me) the information provided above. I have been given a chance to ask questions about this research study, and all of my questions have been answered to my satisfaction. I have been offered a copy of this form for my own records.

**BY CLICKING ON THE “I AGREE TO PARTICIPATE” BUTTON BELOW,
I WILLINGLY AGREE TO PARTICIPATE IN THE RESEARCH IT
DESCRIBES.**

<p>I agree to participate</p>
--

<p>I DO NOT agree to participate</p>

APPENDIX B: EXPERIMENT 2 CONSENT FOR RESEARCH PARTICIPATION

Idaho State University
Human Subjects Committee

Electronic Informed Consent Form for Non-Medical Research

CONSENT TO PARTICIPATE IN RESEARCH

Effects of Priming on Delay Discounting for Different Outcomes

You are asked to volunteer for a research study conducted by Fritz Schoepflin and Steven R. Lawyer, Ph.D., (208-282-2142), from the Department of Psychology at Idaho State University. You have been asked to participate in this research because you are at least 18 years old and report that you are sexually active. Your participation in this research is voluntary. You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

1. PURPOSE OF THE STUDY

The purpose is to examine how different stimuli affect decision-making patterns regarding money and sexual activity.

2. PROCEDURES

If you volunteer to participate in this study, we will ask you to do the following things:

- I. Questionnaires: You will be asked to electronically sign this consent form and complete several brief self-report measures on a computer.
- II. Decision-making tasks: You will complete four behavioral choice tasks in which you will answer questions about your preference for different outcomes.
- III. Photograph rating task: You will rate how appealing 25 photographs are. These photographs may or may not contain nudity and/or sexual content.
- IV. Duration: Participation in the study will involve 45-60 minutes of your time.

3. POTENTIAL RISKS AND DISCOMFORTS

You may experience some discomfort answering personal questions, such as questions about past drug use and sexual behaviors. In addition, you may experience discomfort when viewing sexual photographs. However, this discomfort is not anticipated to be significant.

4. ANTICIPATED BENEFITS TO SUBJECT

There are no tangible benefits to you for your participation.

5. ANTICIPATED BENEFITS TO SOCIETY

Results of this research will be used to better understand how we measure the behavioral processes associated with a variety of social health problem behaviors.

6. ALTERNATIVES TO PARTICIPATION

An alternative is to not participate in the study.

7. PAYMENT FOR PARTICIPATION

You will be rewarded one SONA credit for each half-hour, or part thereof, of participation. If you choose to withdraw your participation for any reason, you will be compensated for however much time you spent on the study. We anticipate that this study will take 45-60 minutes to complete.

8. FINANCIAL OBLIGATIONS

There are no financial obligations to you in the study.

9. EMERGENCY CARE AND COMPENSATION FOR INJURY

There is no anticipated risk of injury associated with this study. Idaho State University does not provide any other form of compensation for injury. No other compensation is available.

10. PRIVACY AND CONFIDENTIALITY

To protect your privacy, the information you provide to us is anonymous and will never be connected with your name. All research-related information will be identified with only a subject number. No information about you, or provided by you during the research, can be disclosed since only subject numbers are used.

11. PARTICIPATION AND WITHDRAWAL

Your participation in this study is VOLUNTARY. If you choose not to participate in the study, this will not affect any benefits from ISU to which you are entitled. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time. You should contact the investigator in charge of this study if you decide to do this.

12. WITHDRAWAL OF PARTICIPATION BY THE INVESTIGATOR

The investigator may stop your participation in this study at any time if circumstances arise which warrant doing so. The investigators, Fritz Schoepflin and Steven R. Lawyer, Ph.D., will make the decision and let you know if it is not possible for you to continue. You may also be forced to withdraw if you do not follow the investigator's instructions.

If you must drop out because the investigator asks you to (rather than because you have decided on your own to withdraw), for any reason other than not complying with the investigator's instructions, you will be compensated with research credits according to the procedures described above.

13. IDENTIFICATION OF INVESTIGATORS

If you have any questions about the research or your participation in the study, please feel free to contact:

Steven R. Lawyer, PhD, Garrison Hall, 921 S. 8th Ave, Stop 8112, Idaho State University, Pocatello, ID 83209-8112, (208) 282-2142

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INDICATION OF CONSENT BY RESEARCH SUBJECT
--

I have read (or someone has read to me) the information provided above. I have been given a chance to ask questions about this research study, and all of my questions have been answered to my satisfaction. I have been offered a copy of this form for my own records.

BY CLICKING ON THE “I AGREE TO PARTICIPATE” BUTTON BELOW, I WILLINGLY AGREE TO PARTICIPATE IN THE RESEARCH IT DESCRIBES.

<p>I agree to participate</p>

<p>I DO NOT agree to participate</p>
--

APPENDIX C: QUESTIONNAIRES

Demographic Information

1. Age _____
2. Gender _____ Male (1) _____ Female (2)
3. Are you currently a student at Idaho State University? Yes (1) No (0)
4. What is your ethnic background?

_____ White/Caucasian (1)	_____ African-American (2)
_____ Hispanic (3)	_____ Native American (4)
_____ Asian/Pacific-Islander (5)	_____ Other (6)
5. Religious Affiliation

_____ Christian (1)	_____ Jewish (2)	_____ Muslim (3)
_____ Buddhist (4)	_____ Agnostic (5)	_____ Atheist (6)
_____ Other (7)		
6. Current marital status:

_____ Single, never married (1)	_____ Unmarried, living with partner (2)
_____ Married, living with spouse (3)	_____ Separated (4)
_____ Divorced (5)	_____ Widowed (6)
7. Please indicate your sexual orientation:

_____ Heterosexual/straight (1)	_____ Bisexual (2)
_____ Gay/Lesbian/homosexual (3)	_____ Asexual (4)
8. Educational background

_____ Sixth grade or less (1)	_____ Some college (6)
_____ Completed 8 th grade (2)	_____ 2-year college degree (7)
_____ Some high school (3)	_____ 4-year college degree (8)
_____ Completed high school (4)	_____ Some graduate school (9)
_____ GED (5)	_____ Completed a graduate program (10)

Financial Information

1. What is your family's current gross annual income? _____
2. What is your current amount of credit card debt? _____
3. In a typical month, how much do you spend on lottery tickets (scratch-off, Powerball, etc.)?

4. Have you ever taken out a payday loan (a short-term loan taken out to cover your expenses until your next pay day)? Yes (1) No (0)
4b. If so, how many times? _____

5. Have you ever taken out a title loan (where you get a loan using your car title as collateral)?
Yes (1)No (0)
4b. If so, how many times? _____

Sexual Desire Inventory (SDI)

This questionnaire asks about your level of sexual desire. By desire, we mean *interest in* or *wish for sexual activity*. For each item, please select the number that best shows your thoughts and feelings. Your answers will be private and anonymous.

1. During the last month, *how often* would you *have liked* to engage in sexual activity with a partner (for example, touching each other's genitals, giving or receiving oral stimulation, intercourse, etc.)?
2. During the last month, *how often* have you had sexual thoughts involving a partner?
3. When you have sexual thoughts, *how strong* is your desire to engage in sexual behavior with a partner?
4. When you first see an attractive person, *how strong* is your sexual desire?
5. When you spend time with an attractive person (for example, at work or school), *how strong* is your sexual desire?

6. When you are in romantic situations (such as a candle-lit dinner, a walk on the beach, etc.), *how strong* is your sexual desire?

1 2 3 4 5 6 7 8 9

No Desire

Strong Desire

7. *How strong* is your desire to engage in sexual activity with a partner?

1 2 3 4 5 6 7 8 9

No Desire

Strong Desire

8. *How important* is it for you to fulfill your sexual desire through activity with a partner?

1 2 3 4 5 6 7 8 9

Not at all
important

Extremely
important

9. Compared to other people of your age and sex, how would you rate your desire to behave sexually with a partner?

1 2 3 4 5 6 7 8 9

Much less desire

Much more desire

10. During the last month, *how often* would you *have liked* to behave sexually by yourself (for example, masturbating, touching your genitals, etc.)?

1. Not at all
2. Once a month
3. Once every two weeks
4. Once a week
5. Twice a week
6. 3 to 4 times a week
7. Once a day
8. More than once a day

11. *How strong* is your desire to engage in sexual behavior by yourself?

1 2 3 4 5 6 7 8 9

No Desire

Strong Desire

12. *How important* is it for you to fulfill your desires to behave sexually by yourself?

1 2 3 4 5 6 7 8 9

Not at all
important

Extremely
important

13. Compared to other people of your age and sex, how would you rate your desire to behave sexually by yourself?

1 2 3 4 5 6 7 8 9

Much less desire

Much more desire

14. *How long* could you go comfortably
without having sexual activity of some kind?

1. Forever
2. A year or two
3. Several months
4. A month
5. A few weeks
6. A week
7. A few days
8. One day
9. Less than one day

Sexual Sensation Seeking Scale

Participant: Please place an “X” in the box that best represents how each of the following statements describes you.

	Not at all like me	Not much like me	A little like me	Very much like me
1. I like wild “uninhibited” sexual encounters				
2. I have made promises I did not mean to keep to get a person to have sex with me				
3. I have felt curious about having sex without a condom				
4. I enjoy the company of “sensual” people				
5. I enjoy watching “X-rated” videos				
6. I have said things that were not exactly true to get a person to have sex with me				
7. I am interested in trying out new sexual experiences				
8. I feel like exploring my sexuality				
9. I like new and exciting sexual experiences and sensations				

SIS/SES for Women

INSTRUCTION

In this questionnaire you will find statements about how you might react to various sexual situations, activities, or behaviors. Obviously, how you react will often depend on the circumstances, but we are interested in what would be the *most likely* reaction for you.

Please read each statement carefully and decide how you would be most likely to react. Then circle the number that corresponds with your answer.

Please try to respond to every statement.

Sometimes you may feel that none of the responses seems *completely* accurate.

Sometimes you may read a statement which you feel is ‘not applicable’. In these cases, please circle a response which you would choose *if it were* applicable to you.

In many statements you will find words describing reactions such as ‘sexually aroused’, or sometimes just ‘aroused’. With these words we mean to describe ‘feelings of sexual excitement’, feeling ‘sexually stimulated’, ‘horny’, ‘hot’, or ‘turned on’.

Don’t think too long before answering, please give your first reaction.

Try to not skip any questions. Try to be as honest as possible.

SIS/SES QUESTIONNAIRE

- 1 = Strongly Agree
- 2 = Agree
- 3 = Disagree
- 4 = Strongly Disagree

1. When I look at erotic pictures, I easily become sexually aroused. 1 2 3 4

2. If I feel that I am being rushed, I am unlikely to get very aroused. 1 2 3 4

3. If I am on my own watching a sexual scene in a film, I quickly become sexually aroused. 1 2 3 4

4. Sometimes just lying in the sun sexually arouses me. 1 2 3 4

5. Using condoms or other safe-sex products can cause me to lose my arousal. 1 2 3 4
6. When a sexually attractive stranger accidentally touches me, I easily become aroused. 1 2 3 4
7. When I have a quiet candlelight dinner with someone I find sexually attractive, I get aroused. 1 2 3 4
8. If there is a risk of unwanted pregnancy, I am unlikely to get sexually aroused. 1 2 3 4
9. I need my clitoris to be stimulated to continue feeling aroused. 1 2 3 4
10. When I am having sex, I have to focus on my own sexual feelings in order to stay aroused. 1 2 3 4
11. When I feel sexually aroused, I usually have a genital response (e.g., vaginal lubrication, being wet). 1 2 3 4
12. If I am having sex in a secluded, outdoor place and I think that someone is nearby, I am not likely to get very aroused. 1 2 3 4
13. When I see someone I find attractive dressed in a sexy way, I easily become sexually aroused. 1 2 3 4
14. When I think someone sexually attractive wants to have sex with me, I quickly become sexually aroused. 1 2 3 4
15. If I discovered that someone I find sexually attractive is too young, I would have difficulty getting sexually aroused with him/her. 1 2 3 4
16. When I talk to someone on the telephone who has a sexy voice, I become sexually aroused. 1 2 3 4
17. When I notice that my partner is sexually aroused, my own arousal becomes stronger. 1 2 3 4
18. If my new sexual partner does not want to use a condom/safe-sex product, I am unlikely to stay aroused. 1 2 3 4
19. I cannot get aroused unless I focus exclusively on sexual stimulation. 1 2 3 4
20. If I feel that I'm expected to respond sexually, I have difficulty getting aroused. 1 2 3 4

21. If I am concerned about pleasing my partner sexually, it interferes with my arousal. 1 2 3 4
22. If I am masturbating on my own and I realize that someone is likely to come into the room at any moment, I will lose my sexual arousal. 1 2 3 4
23. It is difficult to become sexually aroused unless I fantasize about a very arousing situation. 1 2 3 4
24. If I can be heard by others while having sex, I am unlikely to stay sexually aroused. 1 2 3 4
25. Just thinking about a sexual encounter I have had is enough to turn me on sexually. 1 2 3 4
26. When I am taking a shower or a bath, I easily become sexually aroused. 1 2 3 4
27. If I realize there is a risk of catching a sexually transmitted disease, I am unlikely to stay sexually aroused. 1 2 3 4
28. If I can be seen by others while having sex, I am unlikely to stay sexually aroused. 1 2 3 4
29. If I am with a group of people watching an X-rated film, I quickly become sexually aroused. 1 2 3 4
30. When a sexually attractive stranger makes eye-contact with me, I become aroused. 1 2 3 4
31. If I think that having sex will cause me pain, I will lose my arousal. 1 2 3 4
32. When I wear something I feel attractive in, I am likely to become sexually aroused. 1 2 3 4
33. If I am worried about being too dry, I am less likely to get lubricated. 1 2 3 4
34. If having sex will cause my partner pain, I am unlikely to stay sexually aroused. 1 2 3 4
35. When I think of a very attractive person, I easily become sexually aroused. 1 2 3 4
36. Once I am sexually aroused, I want to start intercourse right away before I lose my arousal. 1 2 3 4
37. When I start fantasizing about sex, I quickly become sexually aroused. 1 2 3 4

38. When I see others engaged in sexual activities, I feel like having sex myself. 1 2 3 4
39. When I see an attractive person, I start fantasizing about having sex with him/her. 1 2 3 4
40. When I have a distracting thought, I easily lose my arousal. 1 2 3 4
41. I often rely on fantasies to help me maintain my sexual arousal. 1 2 3 4
42. If I am distracted by hearing music, television, or a conversation, I am unlikely to stay aroused. 1 2 3 4
43. When I feel interested in sex, I usually have a genital response (e.g., vaginal lubrication, being wet). 1 2 3 4
44. When an attractive person flirts with me, I easily become sexually aroused. 1 2 3 4
45. During sex, pleasing my partner sexually makes me more aroused. 1 2 3 4

SIS/SES for Men

INSTRUCTION

In this questionnaire you will find statements about how you might react to various sexual situations, activities, or behaviors. Obviously, how you react will often depend on the circumstances, but we are interested in what would be the *most likely* reaction for you.

Please read each statement carefully and decide how you would be most likely to react. Then circle the number that corresponds with your answer.

Please try to respond to every statement.

Sometimes you may feel that none of the responses seems *completely* accurate.

Sometimes you may read a statement which you feel is ‘not applicable’. In these cases, please circle a response which you would choose *if it were* applicable to you.

In many statements you will find words describing reactions such as ‘sexually aroused’, or sometimes just ‘aroused’. With these words we mean to describe ‘feelings of sexual excitement’, feeling ‘sexually stimulated’, ‘horny’, ‘hot’, or ‘turned on’.

Don’t think too long before answering, please give your first reaction.

Try to not skip any questions. Try to be as honest as possible.

SIS/SES QUESTIONNAIRE

- 1 = Strongly Agree
- 2 = Agree
- 3 = Disagree
- 4 = Strongly Disagree

1. When I look at erotic pictures, I easily become sexually aroused. 1 2 3 4

2. If I feel that I am being rushed, I am unlikely to get very aroused. 1 2 3 4

3. If I am on my own watching a sexual scene in a film, I quickly become sexually aroused. 1 2 3 4

4. Sometimes I become sexually aroused just by lying in the sun. 1 2 3 4

5. Putting on a condom can cause me to lose my erection. 1 2 3 4

6. When a sexually attractive stranger accidentally touches me, I easily become aroused. 1 2 3 4
7. When I have a quiet candlelight dinner with someone I find sexually attractive, I get aroused. 1 2 3 4
8. If there is a risk of unwanted pregnancy, I am unlikely to get sexually aroused. 1 2 3 4
9. I need my penis to be touched to maintain an erection. 1 2 3 4
10. When I am having sex, I have to focus on my own sexual feelings in order to keep my erection. 1 2 3 4
11. When I feel sexually aroused, I usually have an erection. 1 2 3 4
12. If I am having sex in a secluded, outdoor place and I think that someone is nearby, I am not likely to get very aroused. 1 2 3 4
13. When I see someone I find attractive dressed in a sexy way, I easily become sexually aroused. 1 2 3 4
14. When I think someone sexually attractive wants to have sex with me, I quickly become sexually aroused. 1 2 3 4
15. If I discovered that someone I find sexually attractive is too young, I would have difficulty getting sexually aroused with him/her. 1 2 3 4
16. When I talk to someone on the telephone who has a sexy voice, I become sexually aroused. 1 2 3 4
17. When I notice that my partner is sexually aroused, my own arousal becomes stronger. 1 2 3 4
18. If my new sexual partner does not want to use a condom, I am unlikely to stay aroused. 1 2 3 4
19. I cannot get aroused unless I focus exclusively on sexual stimulation. 1 2 3 4
20. If I feel that I'm expected to respond sexually, I have difficulty getting aroused. 1 2 3 4
21. If I am concerned about pleasing my partner sexually, I easily lose my erection. 1 2 3 4

22. If I am masturbating on my own and I realize that someone is likely to come into the room at any moment, I will lose my erection. 1 2 3 4
23. It is difficult to become sexually aroused unless I fantasize about a very arousing situation. 1 2 3 4
24. If I can be heard by others while having sex, I am unlikely to stay sexually aroused. 1 2 3 4
25. Just thinking about a sexual encounter I have had is enough to turn me on sexually. 1 2 3 4
26. When I am taking a shower or a bath, I easily become sexually aroused. 1 2 3 4
27. If I realize there is a risk of catching a sexually transmitted disease, I am unlikely to stay sexually aroused. 1 2 3 4
28. If I can be seen by others while having sex, I am unlikely to stay sexually aroused. 1 2 3 4
29. If I am with a group of people watching an X-rated film, I quickly become sexually aroused. 1 2 3 4
30. When a sexually attractive stranger looks me straight in the eye, I become aroused. 1 2 3 4
31. If I think that having sex will cause me pain, I will lose my erection. 1 2 3 4
32. When I wear something I feel attractive in, I am likely to become sexually aroused. 1 2 3 4
33. If I think that I might not get an erection, then I am less likely to get one. 1 2 3 4
34. If having sex will cause my partner pain, I am unlikely to stay sexually aroused. 1 2 3 4
35. When I think of a very attractive person, I easily become sexually aroused. 1 2 3 4
36. Once I have an erection, I want to start intercourse right away before I lose my erection. 1 2 3 4
37. When I start fantasizing about sex, I quickly become sexually aroused. 1 2 3 4

38. When I see others engaged in sexual activities, I feel like having sex myself. 1 2 3 4
39. When I see an attractive person, I start fantasizing about having sex with him/her. 1 2 3 4
40. When I have a distracting thought, I easily lose my erection. 1 2 3 4
41. I often rely on fantasies to help me maintain an erection. 1 2 3 4
42. If I am distracted by hearing music, television, or a conversation, I am unlikely to stay aroused. 1 2 3 4
43. When I feel interested in sex, I usually get an erection. 1 2 3 4
44. When an attractive person flirts with me, I easily become sexually aroused. 1 2 3 4
45. During sex, pleasing my partner sexually makes me more aroused. 1 2 3 4

Gambling Quantity Perceived Norms Scale (GQPN)

Please read each question carefully and select your answer.

1. Approximately how much spending money (not devoted to bills) do you have each month?

Less than \$50 (1)	\$50 to \$100 (2)	\$100 to \$150 (3)	\$150 to \$200 (4)
\$200 to \$250 (5)	\$250 to \$300 (6)	\$300 to \$350 (7)	\$350 to \$400 (8)
\$400 to \$450 (9)	\$450 to \$500 (10)	More than \$500 (11)	

2. Approximately how often do you gamble?

Never (1)	Once a year (2)	2-3 times per year (3)	Every other month (4)
Once a month (5)	2-3 times per month (6)	Weekly (7)	More than once per week (8)
Every other day (9)	Every day (10)		

3. How often do you think the average college student gambles?

Never (1)	Once a year (2)	2-3 times per year (3)	Every other month (4)
Once a month (5)	2-3 times per month (6)	Weekly (7)	More than once per week (8)
Every other day (9)	Every day (10)		

4. Approximately how much money have you spent (lost) gambling in the past year?

Less than \$25 (1)	\$25 to \$50 (2)	\$50 to \$100 (3)	\$100 to \$200 (4)
\$200 to \$300 (5)	\$300 to \$500 (6)	\$500 to \$700 (7)	\$700 to \$1,000 (8)
\$1,000 to \$2,000 (9)	More than \$2,000 (10)		

5. Approximately how much money have you spent (lost) gambling in the past month?

Less than \$5 (1)	\$5 to \$10 (2)	\$10 to \$20 (3)	\$20 to \$40 (4)
\$40 to \$60 (5)	\$60 to \$100 (6)	\$100 to \$200 (7)	\$200 to \$500 (8)
\$500 to \$1,000 (9)	More than \$1,000 (10)		

6. On average how much money do you spend (lose) gambling *PER MONTH*?

Less than \$5 (1)	\$5 to \$10 (2)	\$10 to \$20 (3)	\$20 to \$40 (4)
\$40 to \$60 (5)	\$60 to \$100 (6)	\$100 to \$200 (7)	\$200 to \$500 (8)
\$500 to \$1,000 (9)	More than \$1,000 (10)		

7. Approximately how much money have you won gambling in the *PAST YEAR*?

Less than \$25 (1)	\$25 to \$50 (2)	\$50 to \$100 (3)	\$100 to \$200 (4)
\$200 to \$300 (5)	\$300 to \$500 (6)	\$500 to \$700 (7)	\$700 to \$1,000 (8)
\$1,000 to \$2,000 (9)	More than \$2,000 (10)		

8. Approximately how much money have you won gambling in the *PAST MONTH*?

Less than \$5 (1)	\$5 to \$10 (2)	\$10 to \$20 (3)	\$20 to \$40 (4)
\$40 to \$60 (5)	\$60 to \$100 (6)	\$100 to \$200 (7)	\$200 to \$500 (8)
\$500 to \$1,000 (9)	More than \$1,000 (10)		

9. On average how much money do you win gambling *PER MONTH*?

Less than \$5 (1)	\$5 to \$10 (2)	\$10 to \$20 (3)	\$20 to \$40 (4)
\$40 to \$60 (5)	\$60 to \$100 (6)	\$100 to \$200 (7)	\$200 to \$500 (8)
\$500 to \$1,000 (9)	More than \$1,000 (10)		

10. How much money do you think the average college student spends (loses) gambling per year?

Less than \$25 (1)	\$25 to \$50 (2)	\$50 to \$100 (3)	\$100 to \$200 (4)
\$200 to \$300 (5)	\$300 to \$500 (6)	\$500 to \$700 (7)	\$700 to \$1,000 (8)
\$1,000 to \$2,000 (9)	More than \$2,000 (10)		

11. How much money do you think the average college student spends (loses) gambling *PER MONTH*?

Less than \$5 (1)	\$5 to \$10 (2)	\$10 to \$20 (3)	\$20 to \$40 (4)
\$40 to \$60 (5)	\$60 to \$100 (6)	\$100 to \$200 (7)	\$200 to \$500 (8)
\$500 to \$1,000 (9)	More than \$1,000 (10)		

12. How much money do you think the average college student wins gambling per year?

Less than \$25 (1)	\$25 to \$50 (2)	\$50 to \$100 (3)	\$100 to \$200 (4)
\$200 to \$300 (5)	\$300 to \$500 (6)	\$500 to \$700 (7)	\$700 to \$1,000 (8)
\$1,000 to \$2,000 (9)	More than \$2,000 (10)		

13. How much money do you think the average college student wins gambling *PER MONTH*?

Less than \$5 (1)	\$5 to \$10 (2)	\$10 to \$20 (3)	\$20 to \$40 (4)
\$40 to \$60 (5)	\$60 to \$100 (6)	\$100 to \$200 (7)	\$200 to \$500 (8)
\$500 to \$1,000 (9)	More than \$1,000 (10)		

Fagerstrom Test for Nicotine Dependence (FTND)

1. How soon after you wake up do you smoke your first cigarette?
 - ☐ After 60 minutes
 - ☐ 31-60 minutes
 - ☐ 6-30 minutes
 - ☐ Within 5 minutes
2. Do you find it difficult to refrain from smoking in places where it is forbidden?
 - ☐ No
 - ☐ Yes
3. Which cigarette would you hate most to give up?
 - ☐ The first in the morning
 - ☐ Any other
4. How many cigarettes per day do you smoke?
 - ☐ 10 or less
 - ☐ 11-20
 - ☐ 21-30
 - ☐ 31 or more
5. Do you smoke more frequently during the first hours after awakening than during the rest of the day?
 - ☐ No
 - ☐ Yes
6. Do you smoke even if you are so ill that you are in bed most of the day?
 - ☐ No
 - ☐ Yes

Alcohol Use Disorders Identification Test (AUDIT)

These questions refer to your use of alcohol. Please circle the answer that is correct for you.

1. How often do you have a drink containing alcohol?

0	1	2	3	4
Never	Monthly or less	2-4 times/month	2-3 times/week	4 or more times/week

2. How many drinks containing alcohol do you have on a typical day when you are drinking?

0	0	1	2	3	4
None	1 or 2	3 or 4	5 or 6	7 to 9	10 or more

3. How often do you have six or more drinks on one occasion?

0	1	2	3	4
Never	Less than monthly	Monthly	Weekly	Daily or almost daily

4. How often during the last year have you found that you were not able to stop drinking once you had started?

0	1	2	3	4
Never	Less than monthly	Monthly	Weekly	Daily or almost daily

5. How often during the last year have you failed to do what was normally expected from you because of drinking?

0	1	2	3	4
Never	Less than monthly	Monthly	Weekly	Daily or almost daily

6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking occasion?

0	1	2	3	4
Never	Less than monthly	Monthly	Weekly	Daily or almost daily

7. How often during the last year have you had a feeling of guilt or remorse after drinking?

0	1	2	3	4
Never	Less than monthly	Monthly	Weekly	Daily or almost daily

8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?
- | | | | | |
|-------|-------------------|---------|--------|-----------------------|
| 0 | 1 | 2 | 3 | 4 |
| Never | Less than monthly | Monthly | Weekly | Daily or almost daily |
9. Have you or someone else been injured as a result of your drinking?
- | | | |
|-------|-------------------------------|---------------------------|
| 0 | 2 | 4 |
| Never | Yes, but not in the last year | Yes, during the last year |
10. Has a relative or friend or a doctor or other health worker been concerned about your drinking or suggested you cut down?
- | | | |
|-------|-------------------------------|---------------------------|
| 0 | 2 | 4 |
| Never | Yes, but not in the last year | Yes, during the last year |

Polydrug Use Questionnaire

How frequently have you tried the following types of drugs over the past 12 months (without a prescription)?

	Never	1-3 times	4-10 times	11 or more times
1. Marijuana				
2. Stimulants (e.g., diet pills, Ritalin, speed)				
3. Cocaine (including crack or PCP)				
4. Hallucinogens (e.g., LSD, mushrooms)				
5. Opiates (e.g., heroin)				
6. Sedatives (e.g., sleeping pills, barbiturates)				
7. other _____				

Sexual Risk Survey (SRS)

In the past six months:

1. How many partners have you engaged in sexual behavior with but not had sex with?
2. How many times have you left a social event with someone you just met?
3. How many times have you “hooked up” but not had sex with someone you didn’t know or didn’t know well?
4. How many times have you gone out to bars/parties/social events with the intent of “hooking up” and engaging in sexual behavior but not having sex with someone?
5. How many times have you gone out to bars/parties/social events with the intent of “hooking up” and having sex with someone?
6. How many times have you had an unexpected and unanticipated sexual experience?
7. How many times have you had a sexual encounter you engaged in willingly but later regretted?

For the next set of questions, follow the same directions as before. However, for questions 8-23, if you have never had sex (oral, anal or vaginal), please put a “0” on each blank.

8. How many partners have you had sex with?
9. How many times have you had vaginal intercourse without a latex or polyurethane condom? Note: include times when you have used a lambskin or membrane condom.
10. How many times have you had vaginal intercourse without protection against pregnancy?
11. How many times have you given or received fellatio (oral sex on a man) without a condom?
12. How many times have you given or received cunnilingus (oral sex on a woman) without a dental dam or “adequate protection”?
13. How many times have you had anal sex without a condom?

14. How many times have you or your partner engaged in anal presentation by a hand (“fisting”) or other object without a latex glove or condom followed by unprotected anal sex?
15. How many times have you given or received analingus (oral stimulation of the anal region, “rimming”) without a dental dam or “adequate protection”?
16. How many people have you had sex with that you know but are not involved in any sort of a relationship with (i.e., “friends with benefits”, “fuck buddies”)?
17. How many times have you had sex with someone you didn’t know well or just met?
18. How many times have you or your partner used alcohol or drugs before or during sex?
19. How many times have you had sex with a new partner before discussing sexual history, IV drug use, disease status and other current sexual partners?
20. How many times (that you know of) have you had sex with someone who has had many sexual partners?
21. How many partners (that you know of) have you had sex with who had been sexually active before you were with them but had not been tested for STIs/HIV?
22. How many partners have you had sex with that you didn’t trust?
23. How many times (that you know of) have you had sex with someone who was also engaging in sex with others during the same time period?

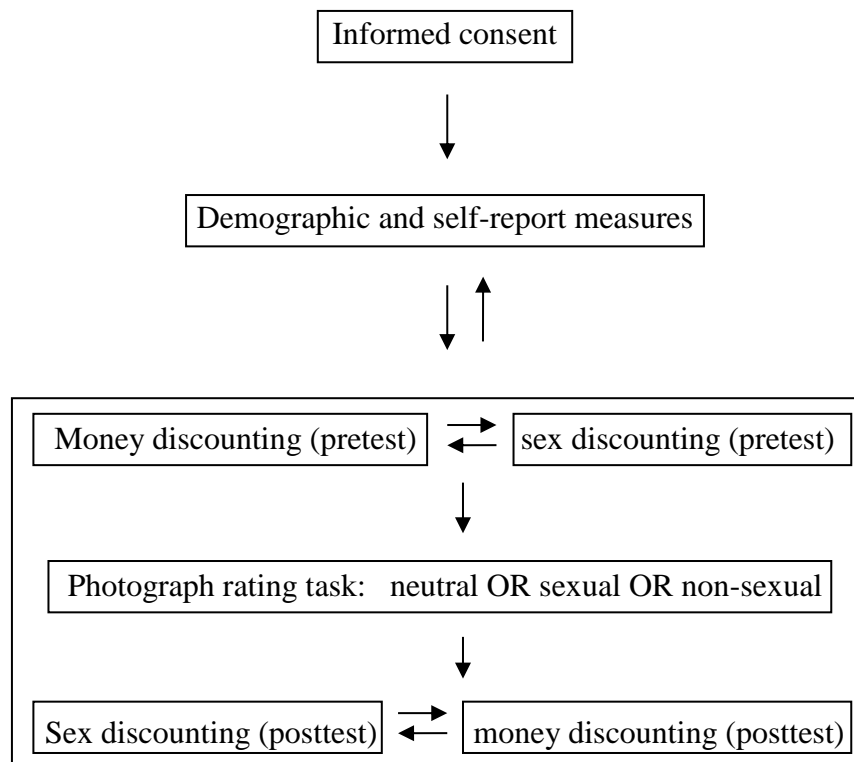
Drug Abuse Screening Test (DAST)

1. Have you used drugs other than those prescribed for medical purposes? Yes / No
2. Have you abused prescription drugs? Yes / No
3. Do you abuse more than one drug at a time? Yes / No
4. Can you get through the week without alcohol/drugs (other than those prescribed for medical purposes)? Yes / No
5. Are you always able to stop using drugs/alcohol when you want to? Yes / No
6. Have you ever attended meetings of Alcoholics Anonymous or Narcotics Anonymous? Yes / No
7. Do you try to limit your alcohol/drug use to certain occasions? Yes / No
8. Have you had “blackouts” or “flashbacks” as a result of your drug/alcohol use? Yes / No
9. Do you ever feel bad about your alcohol/drug use? Yes / No
10. Does your spouse (or parent or significant other) ever express concern about your consumption of alcohol/drugs? Yes / No
11. Do your friends or relatives know or suspect you use/abuse drugs or alcohol? Yes / No
12. Has alcohol/drug use ever created problems between you and your spouse/significant other? Yes / No
13. Has any family member ever sought help for problems related to your alcohol/drug use? Yes / No
14. Have you ever lost friends because of your use of alcohol/drugs? Yes / No
15. Have you ever neglected your family or missed work because of your use of alcohol/drugs? Yes / No
16. Have you ever been in trouble at work because of alcohol/drug use? Yes / No
17. Have you ever lost a job because of alcohol/drug use? Yes / No

18. Have you ever gotten into fights when under the influence of alcohol/drugs? Yes / No
19. Have you ever been arrested because of unusual behavior while under the influence of alcohol/drugs? Yes / No
20. Have you ever been arrested for driving while under the influence of alcohol/drugs? Yes / No
21. Have you ever engaged in illegal activities in order to obtain drugs? Yes / No
22. Have you ever been arrested for possession of illegal drugs? Yes / No
23. Have you ever experienced withdrawal symptoms as a result of heavy alcohol/drug intake? Yes / No
24. Have you ever had medical problems as a result of your alcohol/drug use (e.g., memory loss, hepatitis, convulsions, bleeding, etc.)? Yes / No
25. Have you ever been in the hospital for medical problems related to your alcohol/drug use? Yes / No
26. Have you ever been involved in a treatment program specifically related to alcohol/drug use? Yes / No
27. Have you been in treatment as an outpatient for problems related to alcohol/drug use? Yes / No
28. Have you ever thought you should cut down on your alcohol/drug use? Yes / No
29. Have people annoyed you by criticizing your alcohol/drug use? Yes / No
30. Have you ever felt bad or guilty about your alcohol/drug use? Yes / No
31. Has anyone in your family bloodline (grandparents, parents, etc.) ever had a problem with alcohol/drugs? Yes / No

APPENDIX D: EXPERIMENT 2 SUPPLEMENTAL INFORMATION

Visual representation of Experiment 2 procedure and counterbalances



Arrows represent the procedural order of the study. Double arrows represent counterbalances. Counterbalances were included between self-report/demographic and discounting/photograph rating sections, between sex and money discounting tasks (both pre- and post-test), and between original and alternate forms of each task (not pictured).

Content found in the original MCQ with associated k -values

Rank #	SIR	LDR	Delay (days)	k -value	Bin after
1	54	55	117	0.00016	0.00025
2	47	50	160	0.0004	0.00063
3	54	60	111	0.001	0.0016
4	49	60	89	0.0025	0.0039
5	40	55	62	0.006	0.0098
6	34	50	30	0.016	0.026
7	27	50	21	0.041	0.065
8	25	60	14	0.1	0.159
9	20	55	7	0.25	

Small and large amounts represent hypothetical monetary rewards in USD. SIR - Smaller Immediate Reward; LDR - Larger Delayed Reward.

Content found in the alternate MCQ with associated k -values

Rank #	SIR	LDR	Delay (days)	k -value	Bin after
1	49	50	125	0.00016	0.00025
2	52	55	144	0.0004	0.00063
3	55	60	92	0.001	0.0016
4	52	60	61	0.0025	0.0039
5	35	50	70	0.006	0.0098
6	42	55	19	0.016	0.026
7	33	60	20	0.041	0.065
8	25	55	12	0.1	0.159
9	10	50	16	0.25	

Small and large amounts represent hypothetical monetary rewards in USD. SIR - Smaller Immediate Reward; LDR - Larger Delayed Reward.

Content found in the original SCQ with associated k -values

Rank #	SIR	LDR	Delay (days)	k -value	Bin after
1	28	32	39	0.00365	0.0087
2	16	30	50	0.0175	0.0242
3	18	24	10	0.0333	0.0483
4	10	24	20	0.07	0.0935
5	18	36	8	0.125	0.1768
6	20	30	2	0.25	0.324
7	8	28	6	0.42	0.501
8	4	28	10	0.6	0.7746
9	14	28	1	1.0	

Small and large amounts represent minutes of hypothetical sexual reward. SIR - Smaller Immediate Reward; LDR - Larger Delayed Reward.

Content found in the alternate SCQ with associated k -values

Rank #	SIR	LDR	Delay (days)	k -value	Bin after
1	20	24	55	0.00365	0.0087
2	20	36	46	0.0175	0.0242
3	24	32	10	0.0333	0.0483
4	15	36	20	0.07	0.0935
5	15	30	8	0.125	0.1768
6	16	28	3	0.25	0.324
7	5	26	10	0.42	0.501
8	6	24	5	0.6	0.7746
9	10	30	2	1.0	

Small and large amounts represent minutes of hypothetical sexual reward. SIR - Smaller Immediate Reward; LDR - Larger Delayed Reward.

Sample of photographs used in Experiment 2 priming conditions

Sexually exciting photographs



Non-sexually exciting photographs



Neutral photographs

