

**Choice and Demand, Sex and Success: How Many is Too Many
and What do Males and Females Like?**

Ryan A. Bable

A Dissertation Submitted to the Faculty of

The Chicago School of Professional Psychology

In Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in Applied Behavior Analysis

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Dedication

This dissertation is dedicated to everyone who told me I couldn't succeed academically. To everyone who doubted my motivation, my dedication, and my perseverance. To everyone who heard my name and said, "not him." Put some respect on my name.

Abstract

Behavioral economics has been used to investigate many commodities of interest including money, food, and drugs. One commodity gaining interest is sex and sexual activity. However, research into sex through a lens of behavioral economics is still in its infancy, particularly regarding the strength and elasticity of demand, and choice. The present study sought to investigate variables that affect the strength and elasticity of demand for sex with hypothetical partners, and to determine the extent the overload of choice has on partner selection. Participants completed a demographic form, dating application confidence form, rejection sensitivity survey, and sexual risk survey before completing the behavioral economic procedures. Seventy-six single adults participated in demand measures and 104 single adults participated in choice measures. Demand measures consisted of observing four partner profiles denoting either high or low altruism, intelligence, financial prospect, and intelligence and reporting sexual activity at different response efforts. Choice measures consisted of electing to choose (or not) a hypothetical partner at different array sizes (3, 6, 12, 24, and 48) and rating satisfaction and confidence with that partner. Under strength and elasticity of demand, results were that males showed significantly stronger demand for sex at lower response costs and a more inelastic demand than females, and this was echoed in the case of those using online dating applications. Males showed no differentiation in sexual demand when viewing a partner regardless of highlighted attribute. Both intelligence and financial prospects influenced females' strength of demand for sex. Under choice overload, participants were more likely to waive their ability to choose as array size increased; however, no differences in satisfaction or confidence were found between array sizes. The results guide how mate seekers should present themselves to their desired partner and how choice overload may affect single individuals' choices in partners.

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Chapter 1: Nature of the Study

The present chapter will provide a brief overview of the research that took place. A brief background is provided, followed by the problem statement, purpose of the study, and research questions. Key terms are described, and these will help readers understand concepts in this study. Finally, the significance of the study is provided, concluding with a summary of the present chapter.

Background

Finding a partner is one of the cornerstones of growing up. But how does one find the right partner? How does one even know who is looking for a partner? And what are potential partners interested in? These are all questions every adolescent and young adult will inevitably ask themselves at some point during their lives. There are plenty of magazines devoted to trying to answer these exact questions, from *GQ*, *Men's Health*, and *Esquire* for males, to *Woman's Day*, *Cosmopolitan*, and *Vogue* for females. Each gives tips, tricks, and advice for trying to find and attract the ideal mate. But is that necessary? The answer to these questions may be easier than some of these magazines make it seem.

According to the evolutionary perspective of psychology (Buss, 2003; Buss & Schmitt, 1993; Trivers, 1972), the underlying desire to find a mate is to ensure the reproduction and survival of an individual's genetic material, but the way in which males and females achieve that goal differs due to the biological difference between males and females in insemination and childbirth. In this theory, tested across continents and cultures (Buss, 1989), females are more selective with their mates and place value in a mate that has more resources, social status, and intelligence, whereas males are less selective and place more value in physical attractiveness and sexual fidelity. The unanswered question is just how valuable are those traits in a partner, and

have these hypothesized differences remained the same through the years since the conception of evolutionary psychology?

One area gaining ground in the research of mate selection and sexual activity is behavioral economics (Collado et al., 2017; D'Angelo & Toma, 2017; Dariotis & Johnson, 2015; Dolan et al., 2020; Jarmolowicz et al., 2014, 2015, 2016a; Lawyer & Schoepflin, 2013; Sweeney et al., 2019). Behavioral economics seeks to understand human behavior utilizing the principles of economics, particularly determining how an individual may maximize their utility in a given context (Hursh & Roma, 2013; Thorgeirsson & Kawachi, 2013). Behavioral economics has completed investigation into mate selection under delay discounting (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Sweeney et al., 2019), elasticity of demand (Dolan et al., 2020; Jarmolowicz et al., 2016a), and choice (D'Angelo & Toma, 2017). This research has determined that there may be gender differences in the selection of mates where males value more immediate sex (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Sweeney et al., 2019) and report higher sexual demand (Dolan et al., 2020); however, all procedures used physically attractive or idealized partners, and according to evolutionary psychology, this gender difference should have been expected as males may inherently value physical attractiveness and sex more than females (Buss, 1989, 2003; Buss & Schmitt, 1993; Trivers, 1972). The focus then turns to females, and determining factors that influence the value of sex and partner selection for females.

Another question that warrants investigation is the area of mate selection in general. Online dating applications are a growing trend in finding a partner (Alexopoulos et al., 2020; Fortune, 2021; Iovine, 2020; Link, 2021; Spar, 2020), and these applications boast dozens to

thousands of potential partners to choose from (Spar, 2020). Literature suggests that having too many options may lead to reduced satisfaction with the final choice (Chan, 2015; Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Karsina et al., 2011; Miller et al., 2017; Reed et al., 2011; Saltsman et al., 2019; Schwartz, 2004), but this has been relatively understudied in the area of mate selection and dating applications (D'Angelo & Toma, 2017). It is possible, then, that with the rise of dating applications, boasting a pool of too many partners may be detrimental to overall relationship satisfaction when selecting a partner on these applications. Along with that, there may be differences in the motivation behind using dating applications between males and females (Gatter & Hodkinson, 2016; Guadagno et al., 2012; Tanner & Huggins, 2018), but the effect of dating application use or not has not been studied regarding choice overload, nor has it been investigated regarding the value of sex. With so many missing links in the literature, further analysis and clarification is warranted, particularly under a lens of behavioral economics, in order to determine true gender differences in both the value of sex and what makes sex valuable, and in mate selection differences regarding choice and choice overload in online dating applications.

Problem Statement

First, behavioral economics suggests that males and females may value sex differently. Through delay discounting measures, males may show sexual impulsivity by valuing smaller more immediate sexual activity over longer more delayed sexual activity (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Sweeney et al., 2019). Through elasticity of demand measures, males may report stronger and more inelastic demand for sex (Dolan et al., 2020). Measures in behavioral economic framework have only used sexual activity in combination with partners of high physical attractiveness, which

according to the evolutionary perspective of psychology (Buss, 1989, 2003; Buss & Schmitt, 1993; Trivers, 1972), immediately caters towards males' inherent preferences, suggesting that the true value of sex and gender differences has not been captured. Investigation using behavioral economics need to be conducted with regard to both male and female preferences to identify true gender differences, and to determine if the evolutionary perspective of psychology still remains supported.

Second, there may be thousands of partners on dating applications (Spar, 2020). Research in choice overload has suggested that there may be dissatisfaction with choice outcomes when selecting from too many options (Chan, 2015; Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Karsina et al., 2011; Miller et al., 2017; Reed et al., 2011; Saltsman et al., 2019; Schwartz, 2004), but this phenomenon is relatively understudied regarding online dating applications (D'Angelo & Toma, 2017), particularly regarding reported gender differences in using dating applications (Gatter & Hodgkinson, 2016; Guadagno et al., 2012; Tanner & Huggins, 2018). Choice overload should then be studied for differences regarding status in using dating applications by gender.

Purpose of the Study

The primary purpose of the present study was twofold. The first primary purpose was to investigate the differences in the strength and elasticity of demand for sex between males and females for different accentuated high- and low-attributes reported from the evolutionary perspective of psychology (altruism, intelligence, financial prospect, and social status). The second primary purpose was to determine choice overload differences between males and females, and online dating application users and online dating application abstainers regarding choice behavior and reported satisfaction and confidence with choice outcomes.

Research Questions and Hypotheses

The research questions were as follows:

Research Question 1: Are there gender differences in demand elasticity for sex as a consumable variable?

H_1 1: Males will show stronger and more inelastic demand for sex than females.

Research Question 2: Do different accentuated variables (beyond physical attractiveness) influence demand elasticity within and between genders?

H_1 2: Demand strength and elasticity will be greater influenced by accentuated variables in females than males.

Research Question 3: Are there differences in exercising the right to choose, choice satisfaction, and choice confidence between differing arrays of sexual partners?

H_1 1: Larger arrays will have less choice, less satisfaction, and less confidence.

Research Question 4: Are there any correlations between sexual risk, perceived dating app success, rejection sensitivity, and/or demographic variables?

H_1 2: Significant correlations will exist.

Definition of Key Terms

Behavioral economics. The analysis of how organisms maximize their utility in an environment through the application of economic principles (Hursh & Roma, 2013; Thorgeirsson & Kawachi, 2013).

Choice overload. The dissatisfaction with a decision made as a result of too many choices being available to consumers that may result in unhappiness, decision fatigue, and the deferral of choice (Iyengar & Lepper, 2000; Schwartz, 2004).

Dating applications (dating apps). A partner selection platform that exists on a mobile phone or computer. Mate seekers create a profile that typically involves displaying pictures and brief information about themselves on an online profile, and use that profile to connect, chat, and meet with other interested individuals (Spar, 2020).

Dating app abstainer. Individuals who do not currently use dating apps.

Dating app previous user (previous user). Individuals who have spent at least 1 week using dating apps at some point in their life, but do not currently use dating apps.

Dating app user. Individuals who currently use dating apps, and have engaged with dating apps for more than 1 week.

Delay discounting. The devaluing of a commodity as the delay to receiving that commodity increases (Rachlin, 2006; Rachlin et al., 1991).

Elastic demand. A ready or immediate reduction in the consumption of a commodity as the unit price of that commodity increases (Hursh, 1980).

Evolutionary psychology. The idea that human beings all over the world favor conception and mate selection practices that ensure the survival and reproduction of their offspring, and the acknowledgement that the way in which this is achieved differs between males and females (Buss & Schmitt, 1993; Trivers, 1972).

Inelastic demand. Continued consumption of a commodity in the face of an increasing unit price (Hursh, 1980).

Reinforcement pathology. The high rate of commodity seeking behavior and excessive consumption of a specified commodity at low unit prices (Jarmolowicz et al., 2016b; MacKillop et al., 2009).

Unit price. The response requirement (in combination with quantity/quality) of a specified commodity (Bickel et al., 1993, 1995).

Significance of the Study

The results of the present study will first add to the growing body of literature in behavioral economics and sex. Next, the findings will be significant because they will confirm whether assumptions made by the evolutionary perspective of psychology of males seeing partners as sex objects and females seeing partners as success objects (Davis, 1990) still hold true today. The results may also help guide the behavior of single individuals. If variables that affect the demand for and the elasticity of sex are discovered, then single individuals may use the information to understand how to present themselves in the most ideal way in order to give themselves a better chance of being selected by an ideal mate.

Regarding choice and choice overload, the findings will seek to determine if romantic/sexual partners function the same way as other commodities through an analysis of choice and choice overload. The findings may also help identify at what point a pool of partners becomes too many partners. The results may also help find differences exhibited by males and females, and online daters and online abstainers regarding mate selection and choice differences. A greater understanding of how dating applications may function regarding choice and choice overload will also be able to be made for a greater understanding of the impact they have on mate selecting behavior and the collateral satisfaction and confidence.

Summary

According to evolutionary psychology, males may value physical attractiveness and sex more than females (Buss, 2003; Buss & Schmitt, 1993; Trivers, 1972). Research into behavioral economics and sex have primarily used partners of high physical attractiveness in their analysis

of sex as a dependent variable (Collado et al., 2017; Dariotis & Johnson, 2015; Dolan et al., 2020; Jarmolowicz et al., 2014, 2015, 2016a; Lawyer & Schoepflin, 2013; Sweeney et al., 2019). Because males may inherently value physical attractiveness and sex more than females, this may have unintentionally skewed results towards males reporting more sex. Further analysis in the value of sex that pushes beyond physical attractiveness is then warranted to determine true gender differences.

Choice overload may affect overall satisfaction and willingness to make a choice when presented with a large number of options (Chan, 2015; Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Karsina et al., 2011; Miller et al., 2017; Reed et al., 2011; Saltsman et al., 2019; Schwartz, 2004); however, the impact of this is relatively understudied regarding dating applications (D'Angelo & Toma, 2017), particularly differences between those who use dating applications and those who abstain from their use, and regarding males and females. These missing analyses warrant further investigation.

Chapter 2 will present literature regarding general behavioral economics and behavioral economics and sex, the evolutionary perspective of psychology, courtship and online dating, and choice literature. Chapter 3 will present the methodology of the present study regarding elasticity of demand measures and choice measures. Chapter 4 will detail the results. Group studies were used to determine hypothesized differences, and all accompanying graphs are presented in the Figures section after the references. Chapter 5 interprets the results and reports the potential impact of the findings on guiding the behavior of mate seekers. How this information may be viewed through applied behavior analysis is also addressed in this chapter.

Chapter 2: Review of the Literature

The present chapter will review all literature pertaining to the topic at hand. A brief introduction will take place, followed by an investigation into behavioral economics where delay discounting and the elasticity of demand will be focal points. Research into delay discounting and elasticity of demand regarding sex will then be presented, followed by research into courtship practices that led to the development of online dating applications. Finally, research into the evolutionary perspective of psychology and choice are presented.

Research Strategy

All database searches took place on ProQuest's APA Psych Info® and Google Scholar. For behavioral economics, key terms included behavioral economics, economics of behavior, and behavior analysis economics. For behavioral economics and sex specifically, key terms included delay discounting sex, elasticity demand sex, sex discounting, and behavioral economics sex. For evolutionary psychology, the key term for search was evolutionary psychology. For online dating, key terms included online dating motivation, online dating applications, and dating application motivation. Finally, for choice, key terms included choice overload, paradox of choice, online dating choice, and paradox of choice online dating.

Introduction

There are multiple primary reinforcers for adults, food, water, sleep, and shelter among others (Skinner, 1953). One of these primary reinforcers for adults is sex (Skinner, 1953). Humans live in a world surrounded by sex, and with the evolution of technology, the way humans approach and court sexual relationships has changed drastically (Spar, 2020). From the olden days of the lengthy courtship of a single partner for marriage to the millennium strategy of swiping left and right, the methods used to find partners and sex have changed drastically (Spar,

2020). As described in a seminal book by Buss (2003), motivations for sex and attraction may be different between males and females as males and females may not necessarily find the same things sexually attractive or valuable, and this may be rooted in human evolution. One method of investigating how individuals value commodities is behavioral economics (Hursh, 1980; Hursh & Roma, 2013; Jarmolowicz et al., 2016b; Kagel & Winkler, 1975). This behavioral economic framework has been used to investigate sex (Dolan et al., 2020; Jarmolowicz et al., 2016a), but is still in its youth for understanding how the value of sex changes and what factors influence the value of sex. One factor that may change the value of sex is online dating applications, or dating apps, as these tools may be changing the face of dating, sex, and relationships (Alexopoulos et al., 2020; Spar, 2020). This literature review will focus on general behavioral economics, behavioral economics and its relation to sex, evolutionary psychology, and online dating, and how all these fields may interact to shape an individual's sexual courtship and promiscuity.

Behavioral Economics

Applied behavior analysis (ABA) evolved when behavior analysts began collaborating with economists (Hursh & Roma, 2013). The field of economics is diverse and relies on systematic and controlled observations and testing of economic laws and regulations to determine the ebb and flow of money and spending (Allison, 1983). The laws and regulations that determine this consumerism behavior were developed by laws and rules that govern general human behavior (Kagel & Winkler, 1975), which is the subject matter of behavior analysts (Skinner, 1938, 1953). Skinner (1953) commented that a true science of human behavior should take into consideration individual human behavior which is responsible for economic outcomes (p. 400). The collaboration between behavior analysts and economists led to the first annual conference in behavioral economics at Princeton University in 1984 (Gilad et al., 1984).

Behavioral economics as a field combines psychology and economics to investigate how organisms may actually behave to maximize their utility (Thorgeirsson & Kawachi, 2013), and is generally defined as the understanding of human and animal behavior (typically through reinforcement) by means of the application of economics (Hursh & Roma, 2013, p. 98). Initial applications of behavioral economics tended to focus more on consumer behavior such as explaining purchasing behavior (e.g., Iyengar & Lepper, 2000). The field of behavioral economics has begun moving towards explaining health related behaviors (e.g., Jarmolowicz et al., 2015) as well as the design of lifestyle interventions such as smoking cessation programs (e.g., Tucker et al., 2018). The reconceptualization of economic analyses and concepts offered new independent variables, methods of analyses, and dependent measures, including the interaction of variables under demand analysis, impulsivity behind different reinforcers, and how motivating different reinforcers can be (Bickel et al., 1995; Hursh & Roma, 2013).

Behavioral economic concepts through a lens of ABA was first postulated by Hursh (1980) through an analysis of experimental variability. Hursh noted that response rates between rats and pigeons differed depending on the schedule type, session length, and food deprivation. In studies where the organisms were held at a fixed body weight and given supplemental feedings outside of experimental conditions to keep food intake constant (Catania & Reynolds, 1968; Felton & Lyon, 1966), response output was lower as the organism was granted food outside of experimental conditions requirement free, or what is known as an open economy. On the other hand, when food consumption by these organisms was solely determined by experimental conditions, and not delivered under any other condition freely or not (Collier et al., 1972; Hursh, 1978), response output was high, or what is known as a closed economy. This difference in responding suggested that behavior and consumption of reinforcers may change not

as a function of schedules (Ferster & Skinner, 1957), but as a function of accessibility and opportunity in the marketplace, and suggested that the value of a reinforcer can be manipulated beyond scheduled operant responding.

Hursh (1980) also noted that reinforcers can be distinguished by their elasticity of demand apart from their differences in value. This elasticity of demand is derived simple law of demand, which suggests that as the unit price or response requirement of a commodity increases then consumption will decrease (Allison, 1983; Watson & Holman, 1977). This has been readily demonstrated in the operant behavior of both animals (e.g., Bickel et al., 1990) and humans (e.g., Bickel & Madden, 1999). The elasticity of demand will be described in greater detail in subsequent sections. Finally, Hursh noted that the introduction of new commodities, substitutes, and compliments can also affect the consumption of specific commodities or the amount of choices available. A substitute is the introduction of a new commodity that makes the commodity in question less in demand, or more elastic, thereby reducing consumption/responses (Bickel et al., 1995; Hursh, 1980). A compliment is the introduction of a new commodity that creates a more stable, stronger, or inelastic demand of another commodity, or makes it more elastic by increasing consumption/responses (Bickel et al., 1995; Hursh, 1980). For example, an individual might purchase tortilla chips at a fairly high and stable rate (strong and inelastic demand), but then a new brand of potato chip is introduced to the market that is cheaper than the tortilla chips, and now consumption and purchasing behavior is reallocated to the corn chip (the substitute). When a new brand of dip is introduced specifically for potato chips that tastes delicious, consumption and purchasing behavior then shifts back to the potato chips, and dip purchases also increase (the compliment). The elasticity and strength of demand for one

commodity is dependent in part on the price and availability of other commodities (Hursh & Roma, 2013).

Behavioral economics is not radically different than ABA. Nevin (1995) compared demand elasticity to behavioral momentum and points out the different conceptualization of the reinforcement process. In behavioral momentum, a traditional Skinnerian approach is taken in which consequences select and strengthen the operant response on which it is contingent (Skinner, 1938, 1953). Behavioral economics highlights a contingency constraint that forces an organism to reallocate contingent behavior to maximize a contingency's overall utility (Nevin, 1995). The key to understanding the difference in analysis is in the value of a reinforcer. As described in Hursh and Roma (2013), behavioral economics shifted attention to the total consumption of a particular reinforcer as the primary dependent measure of behavior and the way consumption varies with the cost of reinforcers. In this view, responding itself is regarded as a secondary dependent measure that is still important as it is instrumental in controlling the consumption of reinforcers in question (Hursh & Roma, 2013).

This reconceptualization of behavior analytic approaches into behavioral economic framework has gained steam in recent years, as a ProQuest® search of behavioral economics yields 11,106 results, 7,321 (66%) of which have been published between 2010 to 2019. The most commonly applied behavioral economic framework relating to behavior analysis are delay discounting, demand curve analysis (or the elasticity of demand), and choice (Bickel et al., 1995; Hursh, 1980; Hursh et al., 2013; Hursh & Roma, 2013; Jarmolowicz et al., 2016b; Nevin, 1995). For the purpose of the present review, focus will be placed on delay discounting and elasticity of demand.

Delay Discounting

Delay discounting can be defined as the devaluing of a commodity as the time to receive that commodity increases (Rachlin, 2006; Rachlin et al., 1991). The tendency to discount the value of a commodity as a function of time has been demonstrated in both animals (e.g., Green & Estle, 2003) and in humans (e.g., Bickel & Madden, 1999). Delay discounting is typically quantified via the hyperbolic discounting equation:

$$V = \frac{A}{1 + kD},$$

which describes the valuing (V) of a certain commodity (A) and the rate at which that commodity is discounted (k) as a function of how long the delay (D) is to receipt. k in this case is the critical element, as the rate of discounting is the only free parameter in the equation (Mazur, 1987).

Procedures measuring delay discounting typically deliver the choice between two options: a smaller amount of some commodity available immediately, or a larger amount of some commodity available after a delay (Green & Myerson, 2004). For example, if an individual was offered the choice between \$10 today or \$50 after 2 days, most individuals are going to choose to wait the 2 days. As questions continue and the delay increases, individuals may change their answer if offered the choice between \$10 today or \$50 after 2 months; that same individual may now choose the \$10 today. This process then repeats for different delays and different values (Holt et al., 2012; Richards et al., 1997) to find each point at which the individual switches to the smaller, more immediate reward. This point of switching is known as the indifference point and represents the individualized subjective value of the larger outcome at that delay (Hursh et al., 2013).

This phenomenon of delay discounting is related to psychoanalytical psychology's id pleasure principle (Freud, 1956) and can be conceptualized to what is known as *impulsivity* (Ainslie, 1975). When initially investigated with rats, Davenport (1962) and Logan (1965) found that the reinforcement value of a reward declined significantly as a function of delay when provided with a choice between a different amount of a primary reinforcer at different delays. It is hypothesized that longer delays to receiving some commodity may be evolutionarily disadvantageous as when time increases there is uncertainty as to whether the organism may survive long enough to receive the commodity (Rotter, 1954). The most popular experiments of this nature are the Stanford marshmallow experiments (Mischel et al., 1972) in which children were given the option to consume an edible reinforcer, a marshmallow, after waiting some delay. It was suggested that the ability to delay gratification or show the ability to wait for larger delayed rewards, may be correlated to academic success (Shoda et al., 1990), suggesting there may be inherent benefits in the ability to wait, or not discount rewards.

This tendency to discount rewards tends to remain stable across an individual's life (Anokhin et al., 2011; Audrain-McGovern et al., 2009). Audrain-McGovern et al. (2009) investigated the stability of discounting across time and its relation to acquiring a smoking habit. A longitudinal cohort design was used to track 947 participants from age 15 to age 21. Smoking and delay discounting measures were used as well as measures of peer/household smoking, academic performance, depression, sensation/novelty seeking, diminished attention, hyperactive/impulsive symptomology, and other drug use (Audrain-McGovern et al., 2009). The results suggested that after repeated measures across time, participant discounting did not vary significantly, but baseline delay discounting differences had a significant positive effect on smoking (Audrain-McGovern et al., 2009). Delay discounting appears to be more like a trait like

than state like, as baseline levels promoted smoking acquisition, but smoking did not influence delay discounting (Audrain-McGovern et al., 2009).

The results of Audrain-McGovern et al. (2009) implied the heritable nature of delay discounting as discounting remained stable between adolescence and adulthood, implying that an individual's tendency to discount based on time may be more phylogenic than ontogenic. Anokhin et al. (2011) sought to investigate the heritability of delay discounting in adolescence to determine the genetic and environmental influences on delay discounting using a longitudinal twin design. Participants were asked to make a choice between receiving \$7 immediately and \$10 after 7 days. Results showed significant heritability of delay discounting at ages 12 and 14, suggesting the same genetic factors influence this model at both ages. Along with this, delay discounting outcomes were significantly correlated to substance use, attention deficit hyperactivity disorder, and sensation seeking. The results support the heritability of discounting (Audrain-McGovern et al., 2009) and suggest that the tendency to devalue delayed results may be phylogenic in nature and more physiological than once thought (Anokhin et al., 2011; Audrain-McGovern et al., 2009).

One limitation and criticism of delay discounting framework is that measurement focuses on hypothetical rewards, and researchers have greeted results with skepticism as to whether answers to hypothetical choices reflect real world choices (Bickel et al., 1995; Hursh & Roma, 2013; Kirby & Marakovic, 1995). Attempting to answer this question, Kirby and Marakovic (1995) compared the traditional hypothetical outcomes to potentially real outcomes in monetary delay discounting. Participants completed a typical hypothetical monetary delay discounting procedure (e.g., Rachlin et al., 1991), and were told that one of their decisions would be delivered at the specified immediacy/delay. The results suggested there was little discrepancy

between real and hypothetical rewards as discounting functions of real received rewards resembled those of hypothetical rewards (Kirby & Marakovic, 1995). This sentiment has been echoed in follow-up studies (Johnson & Bickel, 2002), indicating that hypothetical measures in delay discounting and possibly the behavioral economic framework in general resemble actual human decision-making functions, and impulsivity (Ainslie, 1975).

When looking at delay discounting across commodities, the degree of discounting appears to differ per commodity. Delayed monetary rewards appear to be discounted less steeply than nonmonetary rewards (Estle et al., 2007; Odum & Rainaud, 2003; Raineri & Rachlin, 1993). Raineri and Rachlin (1993) compared the delay discounting between automobile use and free vacation time. Each commodity resembled Mazur's (1987) hyperbolic function, but money was discounted less steeply than both automobile use and free vacation time (Raineri & Rachlin, 1993). Differences have also been found comparing consumable and monetary rewards, as Odum and Rainaud (2003) compared delay discounting of money, food, and alcohol in young adults not identifying as alcohol or drug dependent. Using an area under the curve as the primary measure of discounting (Myerson et al., 2001), results showed that money was discounted less steeply than alcohol and food, and that alcohol and food were discounted in a similar fashion (Estle et al., 2007; Odum & Rainaud, 2003). Though research in drug addiction has suggested that drugs are discounted at significantly steeper rates (Audrain-McGovern et al., 2009; Bickel et al., 2011, 2012; Bickel & Marsch, 2001; Johnson et al., 2007), alcohol in this case was discounted at steep rates but no differently than food, indicating that alcohol may be discounted as part of the general discounting process and regarded in the category of a general primary consumable reinforcer rather than a drug. Similar patterns of delay discounting have been found across many different commodities, including food and drink (Estle et al., 2007; Odum & Rainaud, 2003;

Rasmussen et al., 2010), health care and health outcomes (Chapman & Elstein, 1995; Manwaring et al., 201; Odum et al., 2003; Petry, 2003), drugs and drugs of addiction (Audrain-McGovern et al., 2009; Bickel et al., 2011, 2012; Bickel & Marsch, 2001; Johnson et al., 2007), and sexual activity (Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Lawyer et al., 2010; Lemley et al., 2017). However, there may be factors that influence one's discounting.

The amount of a given commodity may influence the degree, or steepness, of discounting. For example, Raineri and Rachlin (1993) found that when participants were given a choice between smaller amounts of hypothetical money now and larger amounts of hypothetical money after a delay, the subjective value of \$100 in 1 year became \$58, a 48% decrease. However, there may be magnitude effects based on the amount of money used as the same procedures suggested that participants subjective value of \$10,000 in 1 year became \$7,500, a 25% decrease. Echoing this sentiment, Mellis et al. (2017) found that there are significant differences in the discounting of different monetary amounts. High-risk substance users and controls completed discounting surveys across different amounts of money from .10 cents to \$1,000. No significant differences in discounting existed between or within groups at small amounts up to \$1. However, more pronounced discounting occurred as the amount of money increased, suggesting that the larger later amount of a given reward can greatly influence delay discounting outcomes (Mellis et al., 2017). This has been replicated with medical/health outcomes (Weatherly & Terrell, 2014) and drug use (Cox et al., 2019).

These studies imply that though the hyperbolic model of discounting appears to remain true across commodities, different commodities can be discounted in different ways, and that the processes measured by behavioral economics may be phylogenetic in nature (Anokhin et al., 2011; Audrain-McGovern et al., 2009). The results led to an understanding of how different

commodities are discounted and the different factors that may influence delay discounting that can go beyond hypothesized phylogeny (Anokhin et al., 2011; Audrain-McGovern et al., 2009). Not only that, but the results facilitate analysis of different commodities through different lenses of behavioral economics to determine how behaviors surrounding those commodities differ as a function of the commodity itself.

Elasticity of Demand

Demand is the primary dependent variable in economics. Put simply, it refers to the amount of some commodity that is purchased or consumed at a given time (Bickel et al., 1995). According to Bickel et al. (1995), behavioral economics' primary interest and dependent variable is consumption of a commodity, which is a departure from the traditional behavior analytic primary dependent variable of responding. Hursh (1993) explained that responding itself is a secondary dependent variable that is still as it is instrumental in both accessing and controlling consumption. The analysis of demand for a given commodity takes place on a demand curve, which plots consumption of a reinforcer or commodity as a function of price changes (Bickel et al., 1995; Hursh, 1980, 1993; Nevin, 1995).

The basic parameters of the demand curve are intensity/strength of demand, which is the amount of consumption at a given point or price, and the elasticity of demand, which is how consumption changes as price changes, denoted by the height and slope of the demand curve itself (Bickel et al., 1995). Put simply by Hursh (1980), a gradually decreasing curve denotes inelastic demand, while a quickly decreasing curve denotes elastic demand. The point at which demand shifts from inelastic to elastic, that is, when consumption/responding significantly decreases or falls to 0, is known as P_{max} , and the rate of change across the demand curve is known as α , or alpha (Hursh & Silberberg, 2008; Jarmolowicz et al., 2016b). The elasticity of

demand is quantified through an exponential model of demand, and is typically charted on a logarithmic axis, with the unit price on the x -axis and consumption/response requirement on the y -axis (Hursh & Silberberg, 2008).

As described in Nevin (1995), the elasticity of demand characterizes the relationship between the consumption of some commodity, the price of said commodity, and the availability of potential substitutes in the market. If the commodity is a primary reinforcer such as water, and no alternatives are available, then consumption typically remains stable. This implies that as response requirements are increased, actual responding increases accordingly (what is known as inelastic demand; Hursh, 1980). Once response requirements increase to a point where an organism becomes more sensitive to the response requirements, actual responding and hence consumption of that commodity decreases (what is known as elastic demand; Hursh 1980). However, this elasticity of demand can change accordingly depending on suitable alternatives on the marketplace, and the economic context in which it is available (Bickel et al., 1995).

For example, Fuji apples currently cost approximately .50 cents per apple. At .50 cents, apple lovers are going to purchase the fruit regularly and at high rates. If Fuji apples were the only apples in the marketplace, then increasing the price to .75 cents per apple might not change the frequency of purchases, nor might it change if it rose to \$1. This would characterize inelastic demand (Hursh, 1980; Hursh & Roma, 2013; Jarmolowicz et al., 2016b). However, one might expect to see the frequency of purchasing decrease modestly if the price rises to \$1.50 or \$2, and one would most certainly expect purchasing to decrease drastically if the price rises to \$5 per apple. This would characterize elastic demand (Hursh, 1980; Hursh & Roma, 2013; Jarmolowicz et al., 2016b). On the other hand, if another brand of apple, Red Delicious apples, becomes available, and they also cost .50 cents per apple, then the frequency purchasing Fuji Apples may

significantly decrease as soon as the price rises to .75 cents per apple. This example illustrates that the context of any given marketplace at a given time and the availability of alternatives can affect the elasticity of demand (Bickel et al., 1995). A variety of commodities are analyzed using this framework in a hypothetical purchasing task for that commodity under different prices/response effort, creating a demand curve (Hursh, 1980).

Early research on the elasticity of demand was primarily concerned with discovering the role of open versus closed economies on consumption of a variety of reinforcers in simple operant arrangements by nonhuman animals (Hursh, 1980, 1984). Hursh (1980) reconceptualized data from a series of previous studies using a demand elasticity model, and reported that strength of demand for nonhuman animals was significantly weaker when allowed free access to primary reinforcers—in this case, food—outside of the experimental arrangement (open economy) when compared to denied access outside of the experimental arrangement (closed economy). The role of closed economies (Hursh, 1980) in behavioral economics has been rigorously studied, and a range of studies have suggested that biologically necessary commodities such as food or water in closed economies will evoke persistent behavior that is very inelastic and insensitive to price/behavioral increases (Bandura, 1991). This same effect has also been demonstrated in the self-administering behavior of psychoactive drugs (Hursh & Winger, 1995).

Researchers quickly noted, however, that slight manipulations in the schedule of reinforcement resulted in drastic changes in the response patterns of these nonhuman animals, confounding the results due to reinforcement schedule differences (Ferster & Skinner, 1957; Jarmolowicz et al., 2016b). This led researchers to favor a progressive ratio breakpoint analysis (Hodos, 1961) that allowed researchers to systematically increase the response required for a specified commodity or reinforcer until no further responding or consuming of the reinforcer

occurred (Jarmolowicz & Lattal, 2010). The utility of progressive ratio breakpoint analysis is that it shifts focus away from the schedule/rate of reinforcement and the behavior of the organism and directs it towards reinforcer production/seeking behavior and consumption. In other words, the focus of behavior shifts to the termination of responding (Jarmolowicz et al., 2016b).

In a seminal study by Hursh and Natelson (1981), male Wistar rats' elasticity of demand was compared between brain stimulation and food. Rats were placed in a chamber with two levers; one delivered a 45mg food pellet, while the other delivered 0.5 s of biophasic square wave brain stimulation. The results suggested that food was relatively inelastic when compared to brain stimulation, suggesting that behavior may persist and show priority towards higher motivating commodities, or that demand for certain commodities differs, and certain commodities are more or less elastic than others depending on the organism's motivation.

Elasticity of demand also allows an analysis of hypermotivation and strength of demand/consumption of a given commodity. Under this analysis addiction propensity may be reflected. Low price sensitivity (inelastic demand), excessive consumption at lower behavioral/monetary prices, and excessive expenditure to obtain the commodity may be brought to light under this model (MacKillop et al., 2009). This hypermotivation, or excessive consumption or strength of demand, can be considered a new paradigm of human behavior, dubbed *reinforcement pathology* (Jarmolowicz et al., 2016b). Reinforcement pathology has been framed to assist in understanding suboptimal behavior in a variety of health domains, particularly addiction behavior (Kearns & Silberberg, 2016; MacKillop et al., 2009).

The primary focus of study in the elasticity of demand in behavioral economics appears to be in the area of substance abuse, another conceptualization of reinforcement pathology

(Jarmolowicz et al., 2016b; MacKillop et al., 2009). In this sense, substance use disorder is characterized by high reinforcement value or excessive consumption at lower cost, combined with extreme bias for selecting smaller more immediate rewards over larger delayed rewards (steeper discounting; Bickel et al., 2017). Numerous experiments have suggested that drug administration is affected by both response requirement and drug dose, and the behavioral economic model of substance abuse has combined these two factors into one independent variable as the proposed *unit price* (Bickel et al., 1993, 1995).

Research using nonhuman animals' addiction behavior suggests that there may be demand differences in the demand elasticity for drugs between doses (Hoffmeister, 1979; Hursh & Winger, 1995; Kearns & Silberberg, 2016; Winger et al., 2006). Hoffmeister (1979) administered opioid infusions to monkeys at four different doses using a progressive ratio schedule, and analysis of the produced demand curves suggested that strength of demand and elasticity changed as a function of dose, suggesting the complexity of variables associated with addiction and substance abuse behaviors in relation to the economic context in which substance addiction exists. This sentiment has been echoed across other organisms. In experiments by Kearns and Silberberg (2016), rats pushed a lever for different doses of intravenous cocaine. Three different dosages were utilized, 0.11, 0.33, and 1.0 mg/kg/infusion, on a progressive ratio schedule that increased within each session. The results suggested that there were differences in the elasticity of demand between doses; the lower dose, 0.11 mg/kg/infusion, was more elastic than the higher doses, replicating previous studies with monkeys (Hursh & Winger, 1995; Winger et al., 2006). These results suggest that in addicted organisms, the dose may play a role in the persistence of responding, or the effortful behaviors one may be willing to expend to satisfy an addiction, which may guide interventions around drug use and drug seeking behavior,

but also suggests that elasticity of demand is not static of the commodity itself and that slight manipulations can change elasticity and strength of demand.

Behavioral economic and demand elasticity measures of drug use have been applied to licit substances (Collins et al., 2014; Tucker et al., 2018). Collins et al. (2014) investigated marijuana use in recreational marijuana users. A marijuana purchasing task was administered to collect strength of demand and elasticity for marijuana use, as well as 2 weeks of real-time use of marijuana. Results were that demand for marijuana was inelastic at low prices and became elastic at higher prices, suggesting that price increases may reduce the reinforcement pathology of marijuana and potentially other drugs. Strength of demand and elasticity was also correlated to real-time marijuana use, suggesting that demand elasticity measures may be an efficacious measure to determine actual use of a drug.

Similar patterns have been found in illicit drugs (Strickland et al., 2019; Yoon et al., 2020). A recent study by Strickland et al. (2019) investigated opioid use disorder (OUD) in adults. Individuals reporting nonprescribed opioid use within the last year completed an opioid purchasing task as well as measures of cannabis demand, delay discounting, and reported their pain levels. Stronger and more inelastic demand was associated with OUD. OUD was also associated with steeper discounting rates. Stronger opioid demand, but not elasticity, was associated with higher levels of reported pain. The procedures also demonstrated test–retest reliability under a model of addicted individuals as a 1-month follow-up revealed similar patterns regarding opioid demand (Strickland et al., 2019).

Research has also taken place in cocaine-use disorder; Yoon et al. (2020) wanted to determine if contingency management success and cocaine use relapse could be predicted under a behavioral economic model using demand elasticity. Individuals actively seeking contingency

management treatment received 1 month of the treatment for cocaine abstinence. A hypothetical cocaine purchasing task was implemented at baseline to determine elasticity of demand and strength of demand for cocaine. Both elasticity of demand and demand strength was correlated to cocaine use within 30 days (Yoon et al., 2020). It was also found that relapse was significantly correlated with increase demand strength for cocaine. The results of this study are significant because along with bringing efficacy to a behavioral economic model of addictions, they suggest that the strength of demand, or reinforcer pathology (Jarmolowicz et al., 2016b; MacKillop et al., 2009), may predict resistance to interventions in substances of addiction. This may identify individuals for whom interventions may require more intensive care than contingency management in addiction (Yoon et al., 2020).

Looking at interventions in addiction and the elasticity of demand, Tucker et al. (2018) investigated cigarette versus very low nicotine content (VLNC) cigarette demand on nicotine addicted individuals. A cigarette demand task was used to indicate demand for how many cigarettes and VLNC cigarettes an individual would purchase at 0.5, 1, and 2 times their current market price. The results suggested that VLNC cigarettes may be a viable substitute for nicotine addicted individuals, and that their availability may reduce tobacco and nicotine consumption, as the reported consumption of VLNC cigarettes increased as the price of regular cigarettes increased. The implications for the results were that reinforcement pathology interventions may be investigated under a behavior economic model (Jarmolowicz et al., 2016b; MacKillop et al., 2009; Tucker et al., 2018). Follow-up studies regarding treatment using a model of demand elasticity also recommend that elasticity and strength of demand for nicotine may also be associated to alcohol and caffeine use, suggesting that demand between addictive substances may be related (García-Pérez et al., 2020).

This notion of elasticity of demand investigating addiction has been expanded across commodities, and interestingly on ultraviolet tanning (Becirevic et al., 2017a, 2017b; Reed et al., 2016), as some studies have suggested that ultraviolet tanning may produce reinforcing effects that resemble the characteristics of abuse disorders (Becirevic et al., 2017a). Reed et al. (2016) sought to quantify abuse liability of ultraviolet indoor tanning by correlating measures of addiction to a tanning purchasing task (TPT). Addiction was measured using a combination of criteria from the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) and a dependency questionnaire. The TPT resembled a hypothetical purchasing task that asked the likelihood of signing up for unlimited tanning on a scale of 0–100 when a hypothetical unlimited tanning pass cost \$0 and progressively increased up to \$60. The results suggested that behavioral economic demand is related to ultraviolet indoor tanning addiction status, and adequately predicted and separated groups based on potentially addicted individuals and nonaddicted individuals (Reed et al., 2016). The impact of these results suggest that assessments of the elasticity of demand may be a useful tool in identifying addicted individuals, as those who report an inelastic demand may be at risk of or already addicted to the monetary or behavioral purchasing of a given commodity (Becirevic et al., 2017a, 2017b; Jarmolowicz et al., 2016b; MacKillop et al., 2009; Reed et al., 2016).

Looking to separate group differences, Becirevic et al. (2017b) assessed ultraviolet indoor tanning addiction in female undergraduate students. The TPT (Reed et al., 2016) was used in conjunction with a behavioral addiction screening questionnaire. The behavioral addiction questionnaire was instrumental in separating risk classification groups, and results from the TPT suggested that the elasticity of demand differed between risk classification groups (Becirevic et al., 2017b). Those who were classified as most at risk by the addiction screening questionnaire

reported stronger demand for tanning services, and this is in line with the construct of behavioral addiction (Jarmolowicz et al., 2016b). Following these results, Becirevic et al. (2017a) investigated how neutral and tanning related cues affect the elasticity of demand (using the TPT; Reed et al., 2016) for ultraviolet indoor tanning. Both reported cravings and the strength of demand increased when participants were cued with ultraviolet tanning images relative to neutral nontanning images. These results echo that of Reed et al. (2016) in that measures of the elasticity of demand may be an adequate assessment of addiction (Becirevic et al., 2017a, 2017b), and that the strength of the addiction may be influenced by imagery related to the commodity in question (Becirevic et al., 2017a).

Consumer choice and reinforcement pathology (Jarmolowicz et al., 2016b) has been studied using the elasticity of demand. Reed et al. (2013) looked at the North American pattern of purchasing of oil from 1995 to 2008 using data on per capita energy consumption for transportation and oil prices. As oil price increased, adjusted for inflation, consumption remained inelastic across road, air, rail, transit, and water. The inelasticity suggests that North America has an addiction to oil, as purchasing behavior remained the same regardless of price increases. The conceptualization of inelasticity of demand suggested that North America and the individuals within may have a behavioral addiction to oil (Reed et al., 2013).

The elasticity of demand may be similar between individual consumers and groups of consumers. Oliveira-Castro et al. (2006) examined the purchasing behavior of individual consumers for nine different products: baked beans, biscuits, cereal, butter, cheese, juice, coffee, margarine, and tea. Results suggested that purchasing behavior followed predictions laid forth by economic theory (Allison, 1983; Watson & Holman, 1977) and conformed to patterns of behavior described by behavioral economics (Hursh et al., 2013). Both group and individual

analyses yielded similar trends between different products, and individual differences in the elasticity of demand are relatively consistent across time but not across products (Oliveira-Castro et al., 2006), indicating that the tendency to value certain reinforcers may show little resistance to change (Reed et al., 2013).

Indeed, it appears that demand elasticity measures can accurately measure and identify those with addictions and at risk for addiction. But each study used hypothetical purchasing tasks, and an argument can be made that a hypothetical purchasing task is just that, hypothetical, and that they do not actually resemble true markers of behavior. However, that does not appear to be the case. A study by Schwartz et al. (2019) compared the essential value of opioids, cigarettes, and alcohol to their hypothesized value by a hypothetical purchasing task in individuals with a history of opioid use. Results suggested that the hypothetical purchasing tasks that analyzed elasticity and strength of demand were correlated to the essential value of each drug, suggesting that hypothetical purchasing tasks may provide a sensitive measure of abuse potential for certain drugs or commodities in at-risk populations, bringing validity to these behavioral economic measures (Kirby & Marakovic, 1995; Schwartz et al., 2019).

There may be individual factors that influence the elasticity in certain organisms. A study by Minervini et al. (2015) investigated the effect that the presence of different hormones can have on the demand elasticity for food in mice. Mice in three different hormone groups were used, including estrogen receptor subtype α , knockout of subtype β , and their wild type controls. A closed economy was used using a progressive ratio schedule of reinforcement for food. The results suggested that mice with the estrogen receptor subtype α showed a significantly more elastic demand for food than the other two groups. These data imply that under certain conditions, estrogens can increase food seeking behavior, suggesting that hormones may alter the

value and elasticity of a certain commodity (Minervini et al., 2015). The results of Minervini et al. facilitate investigation into factors that may influence the strength and elasticity of demand in certain commodities.

Elasticity of demand is effective in analyzing both strength of demand and elasticity of demand in drugs, and from these studies it is apparent that multiple factors may influence both strength and elasticity of the demand (Minervini et al., 2015). One area that is increasingly becoming of interest is sex as a commodity. If behavioral economic principles are orderly, predictable, and potentially heritable for money (Raineri & Rachlin, 1991), food (Oliveira-Castro et al., 2006), drugs (Collins et al., 2014; Strickland et al., 2019; Tucker et al., 2018; Yoon et al., 2020), and tanning (Becirevic et al., 2017a, 2017b; Reed et al., 2016), then surely sex must follow the same suit, and if so, what variables may affect the strength of demand and elasticity of demand for sex?

Behavioral Economics and Sex

Behavioral economics has begun investigation into sexual activity under both delay discounting and elasticity of demand measures. The present section will outline and discuss research in both delay discounting and the elasticity of demand of sex and sexual activity. Particular focus will take place in the elasticity of demand and the limited research and limitations of the present research regarding sex and sexual behavior.

Delay Discounting and Sex

Lawyer et al. (2010) conceptualized the first sexual delayed discounting task. Participants completed typically presented delay discounting procedures, but instead of number of dollars as the commodity in question, it was rephrased as minutes of sexual activity. Participants were offered, for example, a choice between 13 min of sexual activity now or 30 min of sexual

activity in 2 weeks. The results fit the hyperbolic model (Mazur, 1987), suggesting delay discounting procedures can apply sexual activity, and that this impulsivity measure of sexual activity resembles that of other commodities.

Researchers have suggested that the hyperbolic model could be more prominent for sex than other commodities such as money (Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013). Lawyer and Schoepflin (2013) investigated differences in both delay and probability discounting between sexual activity and money. Respondents were asked to choose between an immediate or certain amount of money and a delayed or chance amount of money. This was then repeated while replacing delayed and chance money with minutes of sex. Each respondent also completed surveys investigating their alcohol and nicotine use, frequency of gambling, motivations for sex, and sexual activity. Results were that people discounted the value of sex in a similar fashion to money, replicating Lawyer et al. (2010). Males and females did not discount money at significantly different rates, but males discounted sex at significantly steeper rates. These findings also imply males may have increased motivation for sex than women (Baumeister et al., 2001).

Teasing out these differences further, Jarmolowicz et al. (2014) investigated single commodity discounting of sex and money as well as cross commodity discounting of sex and money in substance addicted males and females. Participants completed four discounting measures: (a) money now versus money later, (b) sex now versus sex later, (c) money now versus sex later, and (d) sex now versus money later. The results supported the notions of previous research that substance addicted individuals have a tendency to discount at significantly steeper rates than matched controls (Bickel et al., 2012), substance addicted individuals have a tendency to discount consumable rewards, in this case sex, at significantly steeper rates

compared to money than matched controls (Estle et al., 2007), and that this is amplified for their drug of addiction (Bickel et al., 2011). Males also reported steeper discounting of sex in general, echoing previous research (Lawyer & Schoepflin, 2013), suggesting potential gender differences in the valuing of sex as a commodity. These gender-based implications should be interpreted with caution, however, as there were only five females in the sample, which could potentially skew data analyzed using between-group statistics.

Honing in on risky behavior surrounding sexual activity, Dariotis and Johnson (2015) investigated delay discounting in relation to sexual risk behavior and substance abuse in adults between 18–24 years old. Participants were asked to make a choice between immediate sex without a condom and delayed sex with a condom for four different hypothetical sexual partners whom they labeled as most want to have sex with, least want to have sex with, most likely to have a sexually transmitted infection (STI), and least likely to have an STI. Surveys investigating HIV knowledge, sexual behavior, substance use, risk attitudes, inhibition, impulsivity, and sensation-seeking. Preference for immediate unprotected sex, or sexual impulsivity, was correlated to lifetime number of sexual partners. Males also showed greater likelihood of unprotected sex than females when condom use was not delayed. The implications of the results suggest that delay discounting may be an efficacious investigation into risky sexual behavior, and, similar to previous studies, that males may be more susceptible to sexual risk and the steeper discounting of sex (Jarmolowicz et al., 2014; Lawyer & Schoepflin, 2013).

Moving analysis out of illegal substances, Lemley et al. (2017) investigated the demand for alcohol, money, and sexual activity using both delay and probability discounting in college students. Participants also completed a Sexual Risk Survey (SRS; Turchik & Garske, 2009), which probes sexual behavior and motivations in the last 6 months. Results were that steeper

discounting of alcohol was positively correlated to steeper discounting of sexual behavior, and those who discounted sex and alcohol at steeper rates were also more likely to report increased sexual risk per the SRS. These findings support ideas from previous literature that steeper sexual discounting is related to risky sexual behavior (Dariotis & Johnson, 2015) and also suggest that sexual discounting measures may be an efficacious measure of sexual risk as well as impulsivity as higher scores on the SRS were correlated to steeper discounting of sexual activity.

In a study of promiscuity, Jarmolowicz et al. (2015) investigated delay discounting differences between high- and low-preferred partners in college students. A multiple stimulus without replacement preference assessment was administered to identify a rank order of preferred partners. Discounting measures for sex were then administered, and participants were asked whether they would prefer immediate sex with a lower-preferred partner now or sex with a higher-preferred partner later. The delays ranged from 1 day to 1 year and depending on their choices, the higher-preferred partner decreased in rank or the lower-preferred partner increased in rank. A simple monetary discounting task and the SRS was also completed. Area under the curve (AUC; Myerson et al., 2001) was analyzed, and the outcomes suggested that those who reported having four or more sexual partners showed steeper sexual discounting, indicating that more frequent sexual partners may be related to sexual impulsivity in some way. Gender differences were also noted as in previous literature (Dariotis & Johnson, 2015; Jarmolowicz et al., 2014; Lawyer & Schoepflin, 2013); however, a small sample size of males makes this conclusion difficult to fully support.

Collado et al. (2017) investigated delayed condom use in the prevention of STIs in college students. Participants selected people from a series of 60 photographs and their choices reflected one of four conditions: (a) whom they most wanted to have sex with, (b) whom they

least wanted to have sex with, (c) whom they thought was most likely to have an STI, and (d) whom they thought was least likely to have an STI (Johnson & Bruner, 2012, 2013). Participants then answered on a scale of 0 to 100 as to whether they would have sex with each person with a condom (0 = *definitely have sex without a condom*, 100 = *definitely have sex with a condom*). This was then repeated, except that the use of a condom was only available after a delay ranging from 1 hr to 3 months, and they rated themselves on waiting these delays. Overall, participants reported steeper discounting when the partner was someone whom they most wanted to have sex with and whom was least likely to have an STI, and males demonstrated steeper discounting than females across conditions. Steeper sexual discounting was also associated with more reported risky sexual behavior, supporting previous research (Dariotis & Johnson, 2015; Jarmolowicz et al., 2015). The implication suggests that discounting measures may be an efficacious measure of sexual risk and the likelihood of risking contracting STIs, and hence can identify at risk individuals for which interventions for safe sex can be implemented. Studies using condom delay (Collado et al., 2017; Johnson & Bruner, 2012) as a measure are particularly startling as studies using the same procedures while administering alcohol to their participants found that alcohol decreased the likelihood of waiting to have condom-protected sex and decreased the likelihood of using an immediately available condom given a partner with a high chance of having an STI (Johnson et al., 2016).

Following the same methods as Collado et al. (2017), Sweeney et al. (2019) investigated the correlation between self-reported sexually risky behaviors and delay discounting of sex, and between real-world instances of unprotected sex and delay discounting of sex. The results of over 700 respondents suggested that higher self-reported sexually risky behavior was correlated to steeper sexual discounting, and this was echoed when using real-world instances of

unprotected sex (Sweeney et al., 2019). Males also reported steeper sexual delay discounting than females, supporting gender differences in sexual discounting that had been previously reported with small sample sizes (Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013). The results also suggest, like previous studies, that delay discounting measures are an efficacious way to measure sexual risk in a given population (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014; Sweeney et al., 2019).

From a delay discounting standpoint, there may be differences between males and females in their valuing and impulsivity behind sex (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Sweeney et al., 2019). It also suggests that delay discounting can be an effective means of reporting and identifying individuals who are at sexual risk (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014; Johnson & Bruner, 2012, 2013; Sweeney et al., 2019). It is also possible that there may be inherent differences between males and females when it comes to motivations behind sex (Buss, 1989, 2003; Buss & Schmitt, 1993), meaning that these differences may be expected. Knowing that sex as a marker of impulsivity resembles other commodities, will the same hold true for sex under measures of the elasticity of demand?

Elasticity of Demand and Sex

Sexual behavior is still a relatively new avenue in the elasticity of demand domain. Initially it was captured by Jarmolowicz et al. (2016a), as participants completed a multiple stimulus without replacement preference assessment for high-, median-, and low-preferred hypothetical sexual partners. Each participant then answered how many sexual acts they would conduct with each identified partner if each sex act cost some amount of money, which progressively increased from \$1 to \$1,000,000. The results were that the strength of demand was

reported accordingly for each partner, and the highest-preferred partner remained relatively inelastic compared to both the median- and lowest-preferred partner as significant differences were also found in the break points (point at which reported sexual acts reduces to 0). These results suggest that sex may follow similar consumption patterns as addictive behaviors and obesity, as risky sexual behavior could be spurred by excessive demand for the commodity of interest along with steeper discounting (Jarmolowicz et al., 2014; Lemley et al., 2017). The limitation here is in the procedures; the purchasing of sex was used, which implies sex working or prostitution, and because participants were college students, the likelihood they have experience of this nature is very low. There was also an extreme amount of individual variability within the data, suggesting there may be another variable at play that affects individual differences in both strength of demand and elasticity of demand.

Because the purchasing of sex with money may not be the most socially valid measure of the elasticity of demand for sex, different measures may be warranted to form more socially valid results. Dolan et al. (2020) sought to rectify this under a different measurement called The Hotel Room Purchase Task. In this task, hotel rooms were used as the hypothetical commodity to assess demand for sex. Cocaine dependent individuals were compared to cocaine abstaining controls. First, participants chose two partners, one whom they would most like to have sex with and one whom they would least like to have sex with. Participants then completed the hotel room purchasing task where they reported how many nights they would purchase in a hotel room in a year at prices ranging from \$10 to \$1,280 (Dolan et al., 2020). Overall, the higher-preferred partner saw a stronger demand (more nights reported) and more inelastic demand compared to the lower-preferred partner. Males also reported stronger and more inelastic demand for sex compared to females, but there were no significant differences between cocaine dependent and

noncocaine dependent individuals (Dolan et al., 2020). These outcomes are significant because they support assertions made in the delay discounting framework that there may be gender differences in their approach to and valuing of sexual activity (Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013), and nights in a hotel room were used to measure the elasticity of demand, which is a more socially valid measure than purchasing sex for money (Jarmolowicz et al., 2016a).

These limited studies (Dolan et al., 2020; Jarmolowicz et al., 2016a) in the elasticity of demand and sex provide an unclear picture of the nature of sex as a commodity under a behavioral economic lens. There may be preference differences in elasticity for the strength and elasticity of demand (Jarmolowicz et al., 2016b), and there may be substance abuse and gender differences regarding the elasticity of demand for sex (Dolan et al., 2020), but with limited research on replication, it is difficult to draw these as conclusive. Along with this, there may be a major variable that could influence how an individual values sex: online dating (Alexopoulos et al., 2020; Spar, 2020; Timmermans et al., 2018).

Courtship

Courtship behavior has changed drastically in the past 100 years (Spar, 2020). The present section will review what courtship has looked like through recent history and how different cultures have approached courtship. A history of how online dating applications came to fruition follows. Finally, an analysis into the motivation for males and females behind using dating applications takes place.

Historical Courtship

Relative to history, finding a mate has been more on the community side than the personal side (Spar, 2020). Individuals typically courted those within their own communities,

and in many cases across cultures, assistance was utilized from an elder or a specified matchmaker (Hu, 2016; Shifra-Niman et al., 2011; Titzmann, 2013). In Jewish communities, a *shadchanim* knew all the families in a given town and tried to match the offspring with those whom they perceived to be a good match (Shifra-Niman et al., 2011). In Indian communities, local matchmakers would carry resumes door to door and families would arrange marriages (Titzmann, 2013). In traditional Chinese marriages, parents arranged marriages by finding those of similar backgrounds while following the rule of matching doors and parallel windows (Hu, 2016). It is clear the procedures employed in finding a mate relied more on matchmaker preference and less on personal and sexual chemistry.

These strategies changed with the turn of the industrial revolution as now new means of transportation gave individuals the ability and opportunity to leave their communities and explore anew; however, with these new explorations came a loss of social and parental matchmaking assistance (Spar, 2020). The *shadchanim* were gone, Indian matchmakers could no longer advertise, and Chinese parents were less able to arrange marriages. As described in Spar (2020), these matchmaking assistants addressed two critical features in the matchmaking game, information and preference. These matchmakers knew all, if not most, of the young males and females in any given community (information), and who was eligible based on family status, social status, social norms, and so forth (preference), and they were so effective that prior to 1950, most individuals were married before the age of 25 (Kumagi, 1984; McLaren, 2014).

Individuals were now on their own to find a partner, changing tactics for seeking sex, love, and marriage as independence increased and the digital era dawned (Spar, 2020). The rise of the internet in the digital era boasted new avenues in dating and mate selection and has

inserted itself into what some may consider the primary means of courtship in the modern world (David & Cambre, 2016; Guiliano, 2015).

The Rise of Online Dating in Courtship

In 1959, computers were still in their earliest phase of development (Gillmor, 2007). Two electrical engineers at Stanford University were exploring how they could be used in modern-day life as part of a school project, and they wanted to see if they could match two sets of 49 items together. These sets of items happened to be the males and females from their math class. The engineers gave the students a questionnaire that asked their height, weight, hobbies, and habits, which were scored and fed to the computer to score the highest possible matches. This resulted in an A for the class and at least one documented marriage from the computed results (Gillmor, 2007). This matchmaking algorithm gained steam as in 1965 a company named TACT started New York's first computerized dating service with print advertisements that featured photographs of females, and matches were sent via paper mail (Paumgarten, 2011). These crude computerized matchmaking procedures set the stage for what would be termed 30 years later as *online dating* when Match.com® was launched (Slater, 2013).

In 1995, Gary Kremen looked to use the internet not for linking businesses together, but for linking individuals together. Specifically, Match.com sought to introduce a new form of matchmaker to the mate seeking world: one that allowed the user the ability to find the information and analyze individualized preferences systematically. The website allowed users to create a profile and request to match with other members, and it was simple and effective (Slater, 2013). What Match.com added that went beyond the matchmakers of old was size and speed; the internet offered a seemingly unending pool of potential partners and could introduce individuals to those partners in a matter of microseconds (Spar, 2020).

Websites offering similar value (e.g., eHarmony™ and OkCupid) began to sprout soon after. Valkenburg and Peter (2007) looked to discover demographic predictors and the profile of people who use the internet for partners, whether romantic or sexual. A large sample of internet users between the ages of 18 and 60 were provided a series of surveys that investigated demographics (age, income, and education), dating anxiety, and the frequency in which they visit online dating websites. The results suggested that motivation for using online dating websites is to find or date a romantic partner, and its use is not related to age or income level; however, males were reported to visit these websites more frequently, and individuals around the age of 40 are the most frequent users (Valkenburg & Peter, 2007). Finally, a significant finding was that low dating anxiety was related to online dating use, suggesting that people without anxiety surrounding dating in general more frequently use the internet to find partners as just another method in the tool belt, which was termed as “the rich getting richer” (Slater, 2013; Spar, 2020; Valkenburg & Peter, 2007).

The next major development came with the introduction of the iPhone. In 2008, Apple coincided the release of the iPhone 2nd generation with the opening of the App Store, which was a platform in which a developer could build some sort of software application (app) that users could download and use on their phone (Spar, 2020). An app called Grindr was birthed during this time, which sought to put a matchmaker right into the palm of any users’ hand (David & Cambre, 2016). Grindr took the iPhone’s ability to store thousands of photos and track location and combined it into an app where any user could both show their photos and location and see other users’ photos and location (Spar, 2020). The app was specifically made and catered to the homosexual community and allowed users to see other users’ profiles in a given area. These profiles had pictures and written information, and if the user liked what they saw or read, they

could initiate a conversation and courtship could begin (Slater, 2013; Spar, 2020). In its first year of conception, Grindr recorded over 3 million users across almost 200 countries (David & Cambre, 2016).

Despite this revolutionary technology of matchmaking, it took 4 years for utilization in the heterosexual community. Nevertheless, when Tinder™ stormed the app store in 2012, the dating world would be forever changed (Spar, 2020). Tinder™ acted just like Grindr™ with its capabilities and platform: simple, visual, and quick (David & Cambre, 2016). No questionnaires or hidden formulas were included, simplifying the platforms of old like Match.com®, and the images uploaded by each user are prominently featured (Grigoriadis, 2014; Yeo & Fung, 2017). Users view one profile that displays a prominent photo, their location, and a small amount of information. If users do not like what they see, they swipe left, sending the profile away unbeknownst to the swiped party. If users do like what they see, they swipe right, and if that swiped party also swipes right then a popup lets each user know they have matched and allows for instant connecting (David & Cambre, 2016; Spar, 2020). The apps are ultimately designed to maximize social, romantic, and sexual encounters between proximate strangers (Yeo & Fung, 2017). Tinder™ became so popular in the single community that as of 2014, approximately 50 million users were registered (Guiliano, 2015), increasing mate selection so efficiently it was deemed the “McDonalds for sex” (David & Cambre, 2016, p. 3).

From Tinder sprouted a gauntlet of imitation apps, each with slight differences attempting to set them apart from the competition: Bumble, where females must initiate the conversations; Hinge, where users comment on a photo or a stock question; Tastebuds, where music interests are the prominent feature; and many more. Also coming with this boom of imitation apps were apps for specific groups of people: Muddy Matches was made for country

siders; Luxy attempts to connect millionaires; Lumen finds dates for individuals over 50 years old; and Kinder looks to match parents and children on play dates. Apps aimed at specific cultures were quick to follow: Christian Mingle allows those faithful Christians to easily connect; JSwipe steps in as the *shadchanim* for the Jewish community of dating application users (Spar, 2020); and TwoMangoes and TrulyMadly allow the Indian community to date before committing to an early and socially approved marriage (Doshi, 2016).

Despite bringing information and preferences to the palm of the user with quick and efficient sorting of potential mates, these dating applications do not seem to have spurred a pandemic of casual sex amongst users (Spar, 2020; Sumter et al., 2017). According to Sumter et al. (2017), for Tinder™ users aged 18–30 specifically, around 20% of users have actively used the app for a one-night stand, and more than 25% of users have found a committed relationship from their swiping. But motivational differences were found between males and females (males were more likely to report using the app for casual sex) and across ages (casual sex was a higher reported motivation in older individuals; Sumter et al., 2017). With these reported gender differences and age differences in mind, the door opens to understand reasons behind dating app use.

Motivation and Dating Applications

Online dating has changed the face of dating, mate seeking, and sex seeking with the introduction of online dating apps (David & Cambre, 2016; Guiliano, 2015; Spar, 2020; Sumter et al., 2017). These dating apps have changed the face of courtship from traditional meeting in person to meeting someone using the phone with the swipe of a thumb, which is becoming a cultural norm (Chan, 2017), and as of 2018 it was estimated that over 1.4 billion swipes occur each day (LeFebvre, 2018). Reports suggest that up to 40% of college students currently use

dating apps (Sawyer et al., 2018), suggesting that dating apps are quickly becoming the primary means of relationship and sex seeking (Chan, 2017; LeFebvre, 2018).

To assess this change in culture surrounding dating and relationships in shifting toward dating apps and their impact, Hobbs et al. (2017) probed how dating apps have influenced current sex seeking behavior, and attitudes towards monogamous partnerships, and other romantic ideals. The results suggest that the presence of online dating apps has indeed changed the culture of relationship and sex seeking toward what is labeled a hook-up culture (Hobbs et al., 2017; LeFebvre, 2018). Dating app users did, however, report preference toward traditional views on relationships (preference for face-to-face encounters and courtship), dating despite this clear acceptance and conformity in the shifting culture. Almost 66% of users reported feeling in control over potential partners on dating apps (Hobbs et al., 2017). The primary motivation for using dating apps was to find dates, with 25% of dating app users reporting using them to seek casual sex partners (Hobbs et al., 2017). These apps have become intermediaries for romance and sex seeking, and individuals are increasingly turning toward these apps as they have more choices for potential partners and an increased network of intimacy (Hobbs et al., 2017).

The demographic of dating app users is of particular interest; according to a meta-analysis by Anzani et al. (2018), young adults between the ages of 24 and 31 are more likely to report dating app use. Users also tend to have higher income levels, having completed at least some undergraduate college, and typically have higher income than those abstaining from use (Zou & Fan, 2017). Dating app users also tend to reside in urban or suburban areas other than rural areas (Smith & Duggan, 2013). Most dating app users' ethnicity tends to be White, and the vast majority of users are single (Alexopoulos et al., 2020; Anzani et al., 2018). General motivations of those users tend to vary when data is aggregated (Gatter & Hodkinson, 2016;

Tanner & Huggins, 2018). The colloquial thought behind dating app motivation by abstainers appears to surround desperate and casual sex (Smith & Duggan, 2013); however, it may not be the primary motivation of all users (LeFebvre, 2018), and this may function as a difference of sexual orientation and gender (Ranzini & Lutz, 2017).

Motivations behind using dating apps appears to differ as a function of gender (Gatter & Hodkinson, 2016; Tanner & Huggins, 2018). Tanner and Huggins (2018) investigated females' motivations for using online dating apps. Data collection took the form of 10 participants answering 10 open-ended interview style questions. The results suggested that the primary motivations for females online dating app use are not sexual in nature. Mainly, motivations revolve around socialization, entertainment, distraction, and curiosity, and this is a stark difference from males (Tanner & Huggins, 2018). Investigation into dating app motivations by Gatter and Hodkinson (2016) examined the individual characteristics of Tinder and online dating agency users. Seventy-five participants completed a series of questionnaires investigating dating app use, sociability, self-esteem, and sexual motivations. There were no significant differences reported between self-esteem and sociability between Tinder users and online dating agency users. A significant gender difference in motivations for use was found in both groups, as males reported primarily using both apps and agencies for casual sex partners, and reported motivation that revolved around sex and sexual gratification (Gatter & Hodkinson, 2016), unlike females who showed motivation that did not revolve around sex (Tanner & Huggins, 2018).

These differences in motivations may also impact how one presents themselves on dating apps. Guadagno et al. (2012) investigated differences in expectations when meeting a partner off dating apps and how people self-represent on dating apps; in particular, the researchers explored *deceptiveness*. Four conditions with increasing likelihood of a date suggested that compared to

females, males were significantly more likely to emphasize their positive characteristics when the prospect of a date was less likely, and males were more likely to alter their reported personality characteristics compared to baseline when the prospect of meeting a potential date increased (Guadagno et al., 2012). In short, males may be more likely to lie in order to access a potential sexual partner, suggesting a high sexual motivation for dating app use (Gatter & Hodkinson, 2016), and implies that risky behavior may be more likely in males surrounding dating app use (Guadagno et al., 2012).

Echoing this sentiment, Blackhart et al. (2014) investigated the dispositional factors that may be related to dating app use. The Big-5 personality and attachment styles test was administered to respondents as well as questionnaires investigating self-esteem, sensitivity to rejection, and behavior pertaining to dating app use. The only measure that predicted the use of dating apps was sensitivity to rejection in that those who were more sensitive to rejection were significantly more likely to use dating apps. Along with this, males reported an increased likelihood to engage in potentially risky sexual behavior after meeting a partner face-to-face, supporting the idea of risky behavior surrounding males using dating apps (Guadagno et al., 2012).

Risky behavior may not be limited to just males on dating apps. Sawyer et al. (2018) examined the prevalence of dating app use and sexual behavior in heterosexual adults. Dating app use, motivations for using online dating apps, trait impulsivity measures, and measures of sexual behavior were recorded for a large sample of undergraduate students. Results revealed that those who use online dating apps report increased sexually risky behavior, more frequent alcohol and drug use prior to sex, more frequent sex without protection/contraception, and more lifetime sexual partners. Though there were no direct measures, when taken in its entirety the

result suggests that dating app use may be related to risky sexual behavior beyond just male dating app users (Hobbs et al. 2017; Gatter & Hodkinson, 2016; Sawyer et al., 2018).

Following risky behavior around dating apps, Alexopoulos et al. (2020) investigated perceptions behind dating app use and infidelity intentions. College students and a sample of online adults were probed, and it was revealed that 36.5% of dating app users identified as single, 23% casually dating, 18.5% seriously dating, 14.2% married, 4.1% cohabitating, 2.8% engaged to be married, and 1% divorced or separated. When aggregated, these demographic results are startling as it implies that almost 40% of the dating app population are in some variation of a committed relationship. Along with this, self-perceived success using dating apps predicted the perceptions of one's self and the dating environment. Those reporting higher levels of self-perceived desirability also reported higher perceived dating app success as well as the intention to commit infidelity (Alexopoulos et al., 2020). In other words, more self-confidence may lead to more risk sexual and promiscuous behavior on online dating apps. This higher self-perceived dating app success appears to predict the risky relationship behavior of committing infidelity and may be a better measure of risky sexual behavior and detrimental behavior than studying frequency of dating app use alone (Alexopoulos et al., 2020).

Using dating apps, ultimately, appears to come down to some of the most fundamental concepts in behavior analysis, positive reinforcement (Skinner, 1938, 1953). Chan (2017) investigated the relationship between factors that lead to using dating apps to look for romance and casual sex. Participants completed surveys on their intent to use dating apps, motivations in searching for romantic and casual sex partners, attitudes towards dating app norms, and evaluated their own efficiency in finding romantic and casual sex partners, the trustworthiness of others using dating apps, and their frequency of phone internet use (Chan, 2017). The results

suggested that those who report efficiency in finding romantic and sexual partners, and those who reported dating apps as a social norm, reported more frequent use. Trust towards people using online dating apps was also a predictor of frequency of use and behavioral intent for romance and casual sex. In other words, those who use dating apps frequently, do so because they have received positive reinforcement (Skinner, 1938, 1953) in the form of romantic/sexual partners. This also suggests that there may be a level of behavioral momentum (Brandon & Houlihan, 1997; Nevin, 1995; Plaud & Gaither, 1996) that can continue dating app use, which may also explain why there is a large sample of dating app users in a committed relationship; if they have already been reinforced for using dating apps at a high rate, then reducing its use may be difficult due to the momentum in which has been reinforced, which may make this problem behavior of infidelity and continuous swiping/ liking very persistent and resistant to extinction or behavioral reduction and replacement strategies (Schieltz et al., 2017).

Though there appears to be a high motivation of sex across dating app users (Alexopoulos et al., 2020; Hobbs et al., 2017; Sawyer et al., 2018), there may be motivational differences as a function of gender (Gatter & Hodkinson, 2016; Guadagno et al., 2012; Tanner & Huggins, 2018). This implies that real world behavior may be different when meeting partners off these dating apps between males and females (Blackhart et al., 2014; Guadagno et al., 2012). These motivational and behavioral differences surrounding sex, sex seeking, and dating apps may be predictable and rooted in human evolution (Buss, 2003; Buss & Schmitt, 1993; Trivers, 1972).

Evolutionary Perspective of Psychology and Sex

There may be inherent differences when it comes to the value and priority of sex (Buss, 2003; Trivers, 1972). In the evolutionary perspective of psychology, it is believed that

differences between males and females in mate selection and sex are phylogenic in nature (Buss, 2003). According to this view, the human race's utmost priority is ensuring the survival of its genetic material, suggesting inherent motivations favor behaviors that will produce the highest probability of conception, birth, and the survival of their offspring. However, how males and females achieve this goal vary (Buss, 2003; Buss & Schmitt, 1993; Trivers, 1972). According to Trivers (1972), the sex that requires more in-depth parental investment, including resources and time required during gestation/development, will be take more consideration into choosing a potential mate. This line of thinking has been expanded by Buss (2003), who suggested that females must be highly selective when it comes to selecting a partner because they are biologically limited in their capacity to birth offspring. In this sense, they must prioritize predictors of success in a partner rather than sexual fidelity, as resources and success in a partner may grant a higher chance of survival of the offspring in question. Males, however, should show a preference toward sexual fidelity and physical attractiveness as they could hypothetically father an unlimited amount of offspring with many different sexual partners. These assumptions have been supported across continents and cultures (Buss, 1989), as well as through experimental procedures such as attribute purchasing for hypothetical partners (e.g., Li et al., 2002).

Sexual motives in college students was investigated by Carroll et al. (1985). Male and female college students were provided questionnaires probing their attitudes toward sex. Results suggested that both males and females in support of sex within a committed relationship, and both males and females emphasize the importance of a loving and secure relationship. Males also reported greater likelihood of engaging in sexual behavior outside of a committed relationship, while females reported a lack of sexual interest outside the confines of a sexual relationship (Carroll et al., 1985). These results are in line with the evolutionary perspective of psychology

and sex by suggesting differences in the value of sex between males and females (Buss, 2003; Trivers, 1972).

Sprecher et al. (1994) sought to investigate samples that moved beyond college aged individuals. Over 1,300 participants completed the study, who were asked to judge how likely they would be marry someone with certain characteristics. These included age differential, history of marriage, presence of children, job security, religion, racial profile, relative earning potential, attractiveness, and relative education. The results confirmed those posited by Carroll et al. (1985) in that males showed preference for and emphasized importance in youthfulness and physical attractiveness and females showed preference for and emphasized earning potential, further supporting assertions by the evolutionary perspective of psychology (Buss, 2003; Trivers, 1972).

If indeed these views are rooted in evolution, then motivations should be universal across humans. This assumption was tested by Buss (1989). Over 10,000 participants across six continents, 33 countries, and 37 cultures were asked to both rate and rank order the importance of different attributes they look for in a potential mate. Results indeed suggested a universality in preference—females were more likely to value available resources and resource potential in mates (e.g., social status and financial prospect) and males were more likely to report reproductive capacity (e.g., physical attractiveness and sexual prowess). These results are significant as they generalize the assumptions made by the evolutionary perspective of psychology (Buss, 2003; Trivers, 1972) across individuals, countries, and cultures.

Deeper investigations outside of western cultures continue to reveal conformity to the evolutionary psychological perspective. Looking specifically at Indian culture, Mardhekar and Aradhye (2010) investigated mate preference and selection. A survey regarding priorities in mate

seeking was administered and results suggested that regardless of gender, education and intelligence were regarded as the most important followed by health, and mutual love/attraction. There were significant gender differences in line with evolution (Buss, 1989, 2003; Carroll et al., 1985; Trivers, 1972), revealing that males were more likely to prioritize physical attractiveness and domestic qualities (cooking, cleaning, etc.), while females were more likely to prioritize education/intelligence, resource stability, chastity, and mutual love/attraction.

Males and females may also cater themselves to these priorities by the opposite sex. In a review of personal advertisements in a conservative newspaper, Davis (1990) recorded how older adults advertise themselves and the characteristics they seek in a mate. Listings were reviewed to determine if they contain or emphasize attractiveness, physique, sex, profession, employment status, financial security, education, intelligence, honesty, humor, level of commitment, and emotional state, and if they asked for pictures. Davis's results suggested that the desired attributes in a partner conformed to stereotypical gender roles at the time and catered to the evolutionary perspective of mate selection to the desired gender (Buss, 2003; Trivers, 1972). Females advertised their preference for financial security, employment, intelligence, and commitment, more so than males. Males advertised preference for physical characteristics more so than females. Physical characteristics were the highest valued characteristic irrespective of gender (Davis, 1990). Males were also more likely than females to place advertisements, indicating the motivation for mate seeking, which is in line with future studies in different modalities (Blackhart et al., 2014; Guadagno et al., 2012). These results have been replicated for females in the United Kingdom, as females continued to rate nonphysical characteristics such as sociability/social status, intelligence, and a sense of humor the most attractive characteristic in a potential partner (Pawlowski & Dunbar, 1999, 2001).

In an attempt to look at differences between behavior and self-reports for mate preferences regarding attractiveness, Feingold (1990) conducted a meta-analysis across five different research paradigms: (a) survey-based studies, (b) lonely hearts advertisements, (c) attractiveness with opposite sex popularity, (d) dyadic interaction partner, and (e) manipulation of attractiveness and similarity in a hypothetical partner. Each paradigm was investigated to find commonalities in results pertaining to the proposed evolutionary theory of psychology and mate preference (Buss, 2003; Trivers, 1972). These same reported gender differences were found across each research paradigm, although differences were more pronounced in self-report measures rather than experimental measures (Feingold, 1990). These results suggest that though self-reports may amplify hypothesized findings, behavioral investigations still support the evolutionary perspective (Buss, 2003; Trivers, 1972), meaning what people may do and say regarding their sexual behavior and motives may correlate.

Males may show a preference to have sex with a large variety of partners (Hughes et al., 2020; Schmitt et al., 2001). Schmitt et al. (2001) postulated that short-term mating goals differ between males and females for sexual variety. The researchers used five different studies to support this. Study 1 consisted of five different samples and found large and consistent sex differences in the desire for short-term sexual variety in that males preferred a higher degree of variety. This was amplified after using statistical control for skewing and statistical outliers. Study 2 replicated the results of Study 1 in a sample of older individuals. Study 3 continued to replicate the results using observational methods. Finally, Study 4 suggested that short-term mating was not correlated to psychological dysfunction and may be correlated to positive mental health characteristics in males. These studies combine to suggest that males desire more lifetime sexual partners and sexual intercourse sooner (supporting sexual delay discounting differences

regarding gender; Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Sweeney et al., 2019), and show increased sexual motivation when compared to females. These data continue to support previous research (Buss, 1989; Carrol et al., 1995; Feingold, 1990; Sprecher et al., 1994) suggesting that the male priority for sexual variability may be static across ages, observed in behavior, and may also be related to positive mental health, which supports the phylogenic nature of this sexual motivation when compared to females.

This view of sexual variety was further supported by Hughes et al. (2020) in two separate studies. In the first study, males were more likely to select a higher number of hypothetical partners when given the opportunity to distribute chances for sexual intercourse with different individuals across a number of situations. This same pattern was found regardless of age or attractiveness of hypothetical partners. Males also reported a preference for their committed partners to frequently change appearance, suggesting variety in appearance may emulate sexual variety (Hughes et al., 2020; Schmitt et al., 2001). In the second study, participants selected short term mates based on photos, to which males were more likely to select a novel person to date rather than repeated dates with the same partner. These results echo those posited by Schmitt et al. (2001), suggesting that males are highly motivated for sexual activity and variability. This growing body of evidence continues to support the universal and potentially phylogenic nature of sexual motivations in males over females (Buss, 1989, 2003; Buss & Schmitt, 1993; Carrol et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994).

Most studies supporting the evolutionary hypothesis of mate selection and preferences have relied on directive questions, which may be susceptible to personal bias and demand

characteristics. To rectify this, Evans and Brase (2007) assessed mate preferences between genders using open ended and indirect questions, and designated same-sex and opposite-sex targets. The frequency in which each participant noted certain preferable traits were noted. The results supported those studies using directive questions (Buss, 1989; Carrol et al., 1995; Feingold, 1990; Sprecher et al., 1994), suggesting that even when not given directive questions, males focused on evaluating physical attractiveness and females focused on evaluating ambitiousness (Evans & Brase, 2007). There were no reported differences in the frequency of evaluative comments for kindness nor intelligence between gender, suggesting they may be of equal importance for both males and females (Evans & Brase, 2007).

Experimental conditions also support the evolutionary perspective of sex and mate selection. Li et al. (2002) investigated how individuals create their ideal partner through an attribute purchasing task. Respondents were provided a list of attributes available for purchase; physical attractiveness, creativity, friendliness, intelligence, work ethic, personality, romantic nature, humorousness, extracurricular activities, and financial prospect. Three different budgets (high, medium, and low) for purchasing were used in order to determine priority in mate characteristics, and the cost of each characteristic was static across budget conditions. Results suggested that females allocated slightly more of their budget toward social characteristics and resources such as intelligence and financial prospect, whereas males allocated slightly more of their budget toward physical attractiveness. This outcome became more pronounced in the medium and low budget conditions, indicating that when mate seekers cannot find someone who has it all, they will overtly seek gender-preferred attributes suggested by the evolutionary perspective (Buss, 2003; Trivers, 1972). The results (Li et al., 2002) also support assertion

made by Davis (1990) as single individuals may see males as success objects and females as sex objects.

As universal as this evolutionary perspective can be, there may still be some differences across cultures. Ahrold and Metson (2010) delivered questionnaires to Euro American, Asian, and Hispanic persons that probed their attitudes on homosexuality, views on gender roles, casual sex, sex outside of a marriage, religious perspectives, and spiritual perspectives. Asian persons expressed more conservative attitudes towards sex in general. In Hispanic and Asian persons, higher acculturation predicted sexual attitudes that were in line with Euro Americans. In females across cultures, conservative sexual attitudes and religiousness were positively related to high levels of spirituality. Religious fundamentalism and intrinsic religiousness were correlated to more conservative sexual attitudes for both the Asian and Euro American samples.

Acculturation, however, did not affect the relationship between religiousness and attitudes towards sex. These results are important because though there may be a universality towards gender differences regarding sexual motivations (Buss, 1989, 2003; Carroll et al., 1985), there may be outside variables that can influence or alter these motivations which would affect the choices being made, including the number of options available on the dating marketplace.

Choice Overload

There is a common belief that the more options an individual has, the more “in control” that individual is (Lefcourt, 1973; Leotti et al., 2010). Humans have the perception of control over environment through choice (Lefcourt, 1973), and this perception of control has been shown to be both a biological and physiological necessity, though not necessarily always desirable (Leotti et al., 2010). Clinical research and neuroimaging studies suggest that the need for control may be biological, and the desire to have alternative options available in an

environmental context is a social norm in the developing world (Haynes, 2009; Leotti et al., 2019). Catania (2013) defined choice as any situation in which two or more responses are available at the same time, and the supremacy of one option over other options in an array, sequence, or hierarchy is called preference, which affects the choice that is made.

In a seminal study of choice, Fisher et al. (1997) investigated the preference for choice in individuals with developmental disabilities in a series of two experiments. In the first experiment, participants made a choice from two options, the choice option in which the participant was able to choose between two preferred items, or the no-choice option in which the researcher chose a preferred item for them. The results were that participants preferred to choose. The second experiment had similar procedures to the first; however, if the participants chose the choice option, they were able to decide between two identified lower preferred items. If the participant chose the no choice option, then the researcher selected a higher preferred item for them. The results of both experiments suggest that when holding all preferences equal, individuals prefer the power to choose, but when a preference disparity exists, individuals will forgo their power to choose in order to access higher preferences. Having the opportunity to choose may then include a reinforcement effect between preference and choice (Ackerlund Brandt et al., 2015).

Though there may be psychological benefits to having choice, there may be limitations to having too much choice (Iyengar & Lepper, 2000; Schwartz, 2004). It is suggested that a larger array of stimuli in which to make a choice (more than 20 stimuli) may have negative outcomes on individuals, including reduced satisfaction in the chosen stimulus, choice regret, and buyer's remorse (Schwartz, 2004). Additionally, too much choice may also result in poor physiological performance such as decreased stamina, poor executive functioning, and reduced self-control

(Vohs et al., 2008). In three experiments, Iyengar and Lepper (2000) evaluated whether more choices are beneficial to individuals, and the desire to make a choice. In the first experiment, two booths were set up that sold a different variety of jams; one offered six, and the other offered 24. Though more customers approached and sampled jams from the booth offering 24 varieties, more purchases were made from the booth offering six. This finding has been replicated across numerous commodities such as chocolates (Chernev, 2003; Iyengar & Lepper, 2000) and retirement plans (Iyengar et al., 2004).

In the second experiment, Iyengar and Lepper (2000) offered extra credit opportunities to undergraduate students. The students were able to earn extra credit for writing an essay under two choice options; a list of six essay topics, or a list of 30 essay topics. Students were more likely to elect to complete the extra credit opportunity when six topics were offered, and performance on the chosen topic was superior when chosen from the list of six topics versus when chosen from the list of 30 topics, indicating that performance may be affected by the number of options and the overload of choice. Additionally, ratings of satisfaction with the outcomes were higher in the group with fewer offered options. These experiments suggest that offering too many options (i.e., choice overload) can be detrimental in the decision-making process, performance, and in the evaluation of outcomes. In the third experiment, participants were given the option to make a choice in sampling chocolates between three groups. The extensive choice group were provided with 30 different chocolates to sample, the limited choice group were provided with six different chocolates to sample, and the no-choice group was provided with a chocolate chosen by the experimenter. After sampling the chosen chocolate, participants completed a survey probing their satisfaction with the choice process, expectations around their choice, satisfaction with their choice, and whether they will purchase the chocolate.

Participants in the extensive choice rated the choice process as more enjoyable but rated the satisfaction with their choice as lower than the limited choice option. When taken together the results suggest that though individuals may be enamored by the opportunity to have more choice, they may be less satisfied with their final choice (Iyengar et al., 2004; Iyengar & Lepper, 2000) and may respond poorly if their choice involves extensive responses (Iyengar & Lepper, 2000; Vohs et al., 2008).

Miller et al. (2017) suggested that how children's choice behavior illustrates choice overload is similar to adults. Three preschoolers were presented with a choice of toys across two conditions. The first had an array of six toys, and the second had an array of 30 toys. For each choice, the child was able to play with the toy for up to 2 min. The total duration of engagement was collected for each choice in each condition, and the results were that each child played with their toy choice from the six-choice condition for longer than that same toy presented in the 30-choice condition. These results add to the body of evidence that suggests that too many options, or choice overload, impacts the outcome measure of the chosen option (Iyengar et al., 2004; Iyengar & Lepper, 2000; Schwartz, 2000; Vohs et al., 2008).

Choice overload may affect an individual on a physiological level. Saltsman et al. (2019) measured cardiovascular changes in participants using an electrocardiogram while viewing the profiles of other people in which they would like to room with, befriend, or date. Participants either viewed 15 profiles or four profiles and were asked to verbally report their decisions and their decision-making process. Participants who viewed the greater number of profiles exhibited cardiovascular responses consistent with greater task engagement, indicating greater perceived subjective value in the decision-making process, and greater threat, indicating fewer perceived resources to manage the demands of making an informed choice. These results bring significant

efficacy to the concept of choice overload suggesting that objective physiological changes occur alongside subjective measures of dissatisfaction when individuals are presented with too many options (Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Schwartz, 2004).

Having too many options may be detrimental to making a choice; however, the methodology to investigate this outcome has been largely hypothetical and in the social psychological framework (Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Schwartz, 2004). Moving into behavior analytic methodology, Reed et al. (2011) investigated choice preferences in human service workers. Three choice options were given to the participants; single option, limited option, and extensive option. Using a hyperbolic model similar to that of delay discounting, each participants choice preference was evaluated for the point at which the preference for each choice option changed. The results showed that as extensive options increased, the preference for making a choice decreased, supporting the notion of the paradox of choice under behavior analytic framework.

Furthering the behavior analytic perspective of choice, Karsina et al. (2011) investigated whether an individual can be differentially reinforced to show a preference for choice. Participants played a computer game where points were earned on selections for choice (free choice in which all options were available, and restricted choice in which only some options were made available) and no-choice opportunities. Two conditions were present; in the equal reinforcement condition participants all earned the same amount of points across choice trials, and in the differential reinforcement conditions more points were earned for making free or restricted choices. A multiple baseline across participants design was used, and the results were that in equal reinforcement condition, no preference was shown. However, when differentially reinforced, preference shifted toward free choice option, and this maintained following the

removal of differential reinforcement outcomes. These findings indicate that an individual's history of reinforcement can affect the preference for making choices between different array sizes.

According to Chan (2015), the concept of choice overload may be modulated by the attractiveness of alternative options. Two groups of participants recruited from Amazon's Mechanical Turk were asked to choose a documentary to watch from either a list of four documentaries or a list of 14 documentaries. Half of each group saw a list of attractive documentaries, and the other saw a list of unattractive documentaries, which were independently verified as attractive or not based on an unrelated study. Participants then rated how satisfied they were with their choice and how enjoyable they felt the documentary would be to watch. The results were that when attractive options were simultaneously available, satisfaction of choice decreased, and when unattractive options were made simultaneously available, satisfaction with choice increased. The results from an increase in attractive options are consistent with choice regret from not having chosen another, perhaps more attractive, option (Baron & Rivot, 1994; Gilovich & Medvec, 1995). Too many unattractive options may have the reverse effect of highlighting the chosen options strengths (Chan, 2015).

When considering sexual behavior and mate selection, this may be a factor influencing risky sexual behavior in those who report dating app use. As mentioned earlier, there may be hundreds or thousands of options in the dating marketplace on dating apps (Spar, 2020), and if research has suggested that poor behavioral outcomes are associated with a high level of choices (Chan, 2015; Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Karsina et al., 2011; Miller et al., 2017; Reed et al., 2011; Saltsman et al., 2019; Schwartz, 2004), this may indicate a higher level of risky sexual behavior in those who use dating apps through dissatisfaction with

choice. Investigating exactly this, D'Angelo and Toma (2017) showed online daters profiles of potential partners from either a large set of 24 partners, or a small set of six partners. Each participant was also given the opportunity to change their selection. Results were that those who saw the large set of profiles were significantly more likely to change their selection after making a final choice than those who saw the small set of profiles. While being able to change the final choice did not affect satisfaction within individuals, those who selected from the large set of profiles and had the ability to change their final choice reported the lowest satisfaction with their selected partner(s).

These findings in choice are important as the use of online dating appears to be rising as the primary means of finding romantic partners (Alexopoulos et al., 2020; Sawyer et al., 2018; Spar, 2020), but research has suggested that having too many options may result in dissatisfaction (Chan, 2015; Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Karsina et al., 2011; Miller et al., 2017; Reed et al., 2011; Saltsman et al., 2019; Schwartz, 2004), particularly with partners that are being selected from an exceptionally large pool (D'Angelo & Toma, 2017). The research on online dating through a lens of choice and choice overload is relatively limited. More research is needed to determine how many options becomes too many in the realm of dating apps, and whether there are differences between those using dating apps and those abstaining from their use regarding satisfaction with their choice, or merely exercising the ability to make a choice.

Summary and Purpose

There appears to be what seems like innate differences in the preference for sex between males and females (Buss, 2003; Trivers, 1972), and online dating may reflect this as males appear to be more motivated to use online dating for sexual activity (Gatter & Hodkinson, 2016;

Guadagno et al., 2012; Tanner & Huggins, 2018). However, there may be sexual motivations for using dating apps in general (Alexopoulos et al., 2020; Hobbs et al., 2017; Sawyer et al., 2018). Behavioral economic framework has shown these sex differences in gender through delay discounting (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Sweeney et al., 2019), but sex as a commodity under demand elasticity is still in its infancy, with only several studies detailing sex as a commodity for consumption (Dolan et al., 2020; Jarmolowicz et al., 2016a) and only one detailing gender differences (Dolan et al., 2020). Furthermore, studies under a lens of the elasticity of demand have looked only at physical attractiveness as the primary variable surrounding sex as a commodity (Dolan et al., 2020; Jarmolowicz et al., 2016a), which, according to research in evolutionary psychology, will result in males reporting stronger demand as it is an inherent preference (Buss, 1989, 2003; Carroll et al., 1985; Trivers, 1975). The understudied demographic then becomes females.

Researchers have suggested that females show preference for a variety of factors, or characteristics, such as intelligence (Buss, 1989, 2003; Buss & Schmitt, 1993; Carrol et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994), financial prospects (Buss, 1989, 2003; Buss & Schmitt, 1993; Carrol et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994), altruism (Arnocky et al., 2017), social status (Pawlowski & Dunbar, 1999, 2001), and confidence (Alexopoulos et al., 2020; Timmermans et al., 2018), which are reported to be higher value than physical attractiveness and sexuality. Therefore, any or all these reported characteristics may influence the value (strength and elasticity of demand) of a potential partner and the value of sex with that potential partner for

females one way or the other. Because of these gaps in the literature, it is proposed that an analysis of sex as a commodity through behavioral economic framework (strength and elasticity of demand) should be further clarified. A variety of characteristics that push beyond mere physical attractiveness should be portrayed to determine how emphasized characteristics impact the strength and elasticity of demand, and to determine if hypothesized differences align with the evolutionary perspective of psychology (Buss 2003; Trivers, 1972).

The impact of online dating and dating apps is relatively unknown as to how or if using dating apps changes the strength or elasticity of demand for sex. Sexual motivations exist primarily in males than females (Gatter & Hodkinson, 2016; Guadagno et al., 2012; Tanner & Huggins, 2018), but may be the general priority of users (Alexopoulos et al., 2020; Hobbs et al., 2017; Sawyer et al., 2018). This may affect the strength and elasticity of sex between those who use dating apps and those who do not use dating apps. It may then be a fruitful endeavor to determine if sexual motivations (strength and elasticity of demand) change as a result of emphasizing certain characteristics. It may also be fruitful to investigate differences between those using dating apps and those not using dating apps, with particular focus on the value of sex.

Online dating also has a seemingly endless number of options in which daters can find a potential mate (Spar, 2020). Choice has been relatively under investigated regarding online dating (D'Angelo & Toma, 2017). Because of this it is also recommended to bring further efficacy to the choice overload and online dating literature by investigating the differences in decision making between online dating and online abstaining individuals regarding hypothetical romantic partners, and their satisfaction with their choices.

Chapter 3: Research Design and Method

The purpose of the following section is to outline the procedures and methodology of the present study. To reiterate from Chapter 1, the two main primary purposes of the present study were: (a) determine factors that influence the strength and elasticity of demand for sex between males and females in confirming if those factors conform to the evolutionary perspective of psychology, and (b) determine differences between males and females, and online daters and online abstainers regarding choice overload in the election to choose a hypothetical romantic/sexual partner, and satisfaction and confidence with selected partners. After a review of the literature, a secondary purpose of the research was identified, which was to determine differences and/or correlation between demand elasticity, sexual risk, rejection sensitivity, and perceived dating success between males and females, and online daters and online abstainers. The present chapter reminds readers of the identified research questions, describes participant characteristics, and defines the setting, materials, and dependent variables that were collected. The procedures are described here, explaining how each dependent variable was collected for both strength and elasticity of demand, and choice overload measures.

Research Questions

The research questions were as follows:

Research Question 1: Are there gender differences in demand elasticity for sex as a consumable variable?

H_{11} : Males will show stronger and more inelastic demand for sex than females.

Research Question 2: Do different accentuated variables (beyond physical attractiveness) influence demand elasticity within and between genders?

H_{12} : Demand strength and elasticity will be greater influenced by accentuated variables in females than males.

Research Question 3: Are there differences in exercising the right to choose, choice satisfaction, and choice confidence between differing arrays of sexual partners?

H_{11} : Larger arrays will have less choice, less satisfaction, and less confidence.

Research Question 4: Are there any correlations between sexual risk, perceived dating app success, rejection sensitivity, and/or demographic variables?

H_{12} : Significant correlations will exist.

Participants

A total of 76 participants (40 females) participated in the demand elasticity portion, and 104 participants completed the choice overload portion (73 females). Recruitment took place via research recruitment and exchange groups on Facebook and the Chicago School of Professional Psychology's university-based internal recruitment system (see Appendix A for the recruitment flyer). The criteria for inclusion were the following: (a) aged 18 and over as this is the typical age of consent across states; (b) declaring oneself as sexually active by attesting to having had sexual intercourse, vaginal or anal, at least one time; and (c) identifying as single, which is declaring as not engaging in a strictly monogamous relationship and being open to meeting new sexual partners. To qualify for the online dating application questionnaires, participants needed to have experience with online dating applications, which was defined as currently using any dating app for at least 1 week. Twenty-eight individuals (25 females) were excluded from elasticity measures due to sporadic (inconsistently alternating between high and low levels of sexual activity) and reverse (reporting the most consumption at the highest unit price) responding.

Screening

During recruitment, the criteria for participation (described above) was displayed. In order to confirm each participant met the inclusion criteria, the first section of the survey seen was the inclusion criteria clearly written out in bullet points with a statement saying, “I have read the above inclusion criteria and attest that I meet all criteria.” A button saying “True” and “False” followed. By clicking “True” each the participant attested to meeting the screening criteria, and by clicking “False” the survey was exited. See Appendix B.

Informed Consent

After attesting, informed consent was delivered (Appendix C). The nature and procedures of the present study, risks and benefits to participation was displayed, and detailed steps to ensure anonymity and security of data and responses. Consent was gained electronically, and after reading the consent form, each participant selected either, “I consent” and “I decline.” By clicking “I consent” the participant proceeded to the demographics form to begin the procedures, and by clicking “I decline” the survey was exited.

Materials

Each section of the procedures was completed on either a computer or Smartphone, though due to the length of the procedures it was recommended that participants complete the procedures on a personal computer. Smartphones were required to be the most updated version of Apple® (iOS 13.6) or Android (version 10). Apple® Mac computers were encouraged to have OS X 10.5 (Catalina) or later and Windows computers were encouraged to be Windows 10 or higher.

Setting

All sections of the study were sent to each participant via an anonymous link through QualtricsXM®. Participants could complete each section of the procedures in the setting of their choice. Participants were, however, encouraged to complete each section in a private and quiet area where they felt comfortable in order to foster accurate and attentive responding.

Dependent Variable and Measurement

The primary dependent variable was the demand elasticity *break point*. This was defined as the first point at which hypothetical sexual responding reduced to zero. A secondary dependent variable was the demand elasticity *significant point*, which was defined as the point at which hypothetical sexual responding decreased by more than half of the previous data point. Each of these variables were ordinally coded from 1 to 12 for each date level where one date remained 1; two dates remained 2; three dates remained 3; five dates was scored as 4; 10 dates was scored as 5; 20 dates was scored as 6; 50 dates was scored as 7; 75 dates was scored as 8; 100 dates was scored as 9; 200 dates was scored as 10; 500 dates was scored as 11; and 1,000 dates was scored as 12.

AUC (Myerson et al., 2001) was calculated for each participant demand curve. For each participant, the number of dates was expressed as a proportion of the maximum number of dates to calculate an x value, and the number of reported sexual encounters at each date value was expressed as a proportion of the maximum sexual acts, 1,000, for the corresponding y value (Jarmolowicz et al., 2015). This process resulted in the computation of a series of trapezoids under the following equation:

$$A = (x_2 - x_1) \frac{(y_1 + y_2)}{2}$$

These trapezoid areas was then summed to obtain the AUC measure for each participant's demand curve.

Rejection sensitivity, sexual risk, and app confidence were also dependent variables for measure (described below). Independent samples ANOVAs were utilized for both measures of sexual risk (Turchik & Garske, 2009), rejection sensitivity (Blackhart et al., 2014; Downey & Feldman, 1996), and demand elasticity to determine inherent demographic differences. Independent measures ANOVAs were utilized to determine demand elasticity differences between hypothetical sex partners for each individual participant. Pearson's r and Kendall's Tau- b were used to determine the correlation and predictability of demand elasticity to sexual risk (Turchik & Garske, 2009), rejection sensitivity (Downey & Feldman, 1996), and confidence measures (Alexopoulos et al., 2020). All data analysis took place on IBM® SPSS®, and AUC (Myerson et al., 2001) quantitative measures took place through an AUC calculator via Microsoft Excel (Reed et al., 2012). Independent samples t tests were used to determine group difference between males and females in sexual risk (Turchik & Garske, 2009), elasticity break and significant break points (Jarmolowicz et al., 2016a), rejection sensitivity (Blackhart et al., 2014; Downey & Feldman, 1996), and confidence measures (Alexopoulos et al., 2020).

Regarding choice overload, three dependent variables were measured. First, *choice preference*, which was the relative percent in which the participant selected the choice, no-choice, and control option based on the number of options presented within an array. Second, *choice satisfaction*, which was the participant's satisfaction with the chosen partner and was measured on a Likert scale of 0 (absolute dissatisfaction) to 100 (absolute satisfaction). Finally, *choice confidence*, which was the participant's confidence that they did in fact choose the most

attractive partner for them compared to all other partners presented and was measured on a Likert scale of 0 (absolute doubt) to 100 (absolute confidence).

Interobserver Agreement and Treatment Integrity

All dependent variables were self-reported by participants, and as such did not require a second observer to determine scores. Questions in the procedures in QualtricsXM® were specifically so that all questions were required in order to progress. Each question also had content validation set so that only whole numbers were able to be used to ensure the fidelity and objectivity of the reported data.

All procedures were automated and progress through QualtricsXM®. As such, no treatment integrity for the independent variable was required. In the 3 weeks of data collection, the survey was tested for logic and flow each week for declaring as male, female, using dating apps, and selecting gendered participants. No procedural issues arose. Group assignments were random and determined through a virtual coin flip via the QualtricsXM® platform.

Experimental Design

Dating Success, Rejection Sensitivity, Sexual Risk, and Demand Elasticity

One design of the present study is a between-groups design. This is a large N study that utilizes behavioral economic measures, making quantitative statistics appropriate for data analyses (Becirevic et al., 2017a, 2017b; Jarmolowicz et al., 2016a; Reed et al., 2016). Control is demonstrated through statistical significance, or the p value, which was set at the .05 value. One cannot say correlation implies causality, and as such control cannot be guaranteed through correlations; however, these will still be conducted as a $p < .05$ implies a strong relationship between variables and suggests there is a strong (95% chance) they are predictably related.

Choice Overload

For choice overload procedures, a reversal design and concurrent-chains arrangement was used to demonstrate experimental control. Participants were exposed to “baseline” and “overload” phases which varied the number of profiles presented within an array. A return to baseline separated each overload phase. During each trial, regardless of phases, there was an initial link, terminal link, satisfaction rating, and confidence rating. The initial link had three options (choice, no-choice, and control) from which to choose and demonstrated their preference for choice. The terminal link included procedures based on the participant’s selection in the initial link. The satisfaction and confidence ratings allowed for social validity measures of the participant’s choices.

Procedures

Each participant progressed through the procedures systematically. First, participants were presented with the informed consent, demographic form, perceived dating app success survey, rejection sensitivity questionnaire, and the sexual risk survey. Following these surveys, demand elasticity procedures were conducted to measure participants’ choices between hypothetical dating partners based on specific characteristics. Finally, the choice overload procedures were conducted.

Demographic Form

Participants first completed a demographic form that included age, identified gender, highest education completed, annual income level, sexual orientation, political affiliation, religion, nationality, ethnicity, lifetime sexual partners, and online dating status. If the participant selected that they were currently using dating apps, they were asked the following questions

related to their dating application use: (a) how often dating apps are used, (b) motivation for using dating apps, and (c) perceived dating app success (Alexopoulos et al., 2020).

Perceived Dating App Success

Participants who identified as dating app users were asked about their *perceived* dating app success. First, participants were asked, “Please indicate, on average, how many in 10 dating app users you swipe/click yes on match with you,” and then, “Please indicate, on average, how many in 10 dating app users you match with that start a conversation with you.” Finally, participants were asked about their self-perceived desirability, which entailed rating on a scale of 1–100 the percentage of dating app users whom have seen their profile and want to match with them (Alexopoulos et al., 2020; Timmermans et al., 2018). The first and second question were respectively multiplied by 10, and then all three were added together and divided by 3, resulting in a perceived app success score.

Rejection Sensitivity Questionnaire

The Rejection Sensitivity Questionnaire (RSQ; Downey & Feldman, 1996) has two versions, and 18-item and an 8-item questionnaire. The RSQ targets an individual’s concern or anxiety around a given situation and their expectations that they will be accepted in that given situation. The RSQ is based on the expectancy-value model (Bandura, 1986), has been demonstrated to have internal test–retest reliability (Blackhart et al., 2014; Downey & Feldman, 1996), and previous research has shown that those high in rejection sensitivity may be more likely to use online dating applications (Alexopoulos et al., 2020). The eight-item questionnaire was used for the present study. Both concern/anxiety and expectation of rejection were scored on a 6-point scale. Expectancy of rejection is calculated by in the following equation: expectancy of rejection = 7 – expectancy of acceptance. This was then multiplied by the degree of

concern/anxiety for the given situation. To find the total rejection sensitivity score, each situation score is added and then divided by 8, the number of total situations.

Sexual Risk Survey

The Sexual Risk Survey (SRS; Turchik & Garske, 2009) was a 23-item questionnaire that measures the frequency of engagement in sexually risky behaviors. The SRS assesses sexual risk over the past 6 months across five different categories: risky sex with uncommitted partners, risky sex acts, impulsive sexual behavior, intent to engage in risky sexual behavior, and risky anal sex. Each of these five categories were summed to create a final SRS score. The SRS has shown to have substantial internal test–retest reliability (Turchik & Garske, 2009) and has been correlated to measures of sexual impulsivity (Dariotis & Johnson, 2015; Jarmolowicz et al., 2015; Lemley et al., 2017).

Demand Elasticity Measures

Participants were randomly assigned to one of two groups to see four partners of moderate physical attractiveness. Each partner was displayed one at a time and will resemble a dating profile in their presentation. Group 1 ($N = 31$) saw four profiles that had one partner suggesting a high financial prospect, one suggesting low intelligence, one suggesting high social status, and one suggesting low altruism/kindness. Group 2 ($N = 45$) saw four profiles that had one partner suggesting a low financial prospect, one suggesting a high intelligence, one suggesting a low social status, and one suggesting high altruism/kindness. Each partner was displayed one at a time. See Figure 1 for partner pictures and profiles.

All partner profile pictures were sourced from a study completed before and independently of the present study. A survey form was sent out on social media in which participants ($N = 271$) rated the physical attractiveness of 30 males and 30 females on a scale of

1 (*very unattractive*) to 10 (*extremely attractive*). Four male and four female profiles were chosen provided they fell between an average attractiveness score of 6 and 8, and a standard deviation of less than 2. This range was established so that partners were subjectively attractive, but not so subjectively attractive that potential malleability of sexual demand would be washed out by high physical attractiveness.

Participants were asked a series of sex purchasing questions while viewing each individual partner profile. The instructions resembled Jarmolowicz et al. (2016a), using dates instead of money. The prompt read as follows: “How many times would you have sex with this person, beginning today, if each sex act required ___ dates?” The date requirement progressively increased in value from one date to one thousand dates, and participants were able to respond with a number of sexual acts up to 1,000. This process repeated for each partner.

Choice Overload

During the choice overload procedures, participants were presented with an array of profiles for hypothetical dating partners and were asked to choose their most preferred partner. A variety of attractive and unattractive options were presented, each with a brief blurb about them that was sourced from real dating profiles (see Figure 2 for examples), emulating the online dating experience (D’Angelo & Toma, 2017; Spar, 2020). Each trial included an initial link, terminal link, satisfaction rating, and confidence rating, and each phase included three trials.

Baseline. During baseline trials (A), three profiles were presented to the participant. Each profile included a profile picture and a brief narrative description of that individual.

Overload. During overload trials, a progressively increasing number of profiles were presented to the participant. Each profile included a profile picture and a narrative description of that individual. During the first overload phase (B), there were six profiles; during the second

overload phase (C), there were 12 profiles; during the third overload phase (D), there were 24 profiles, and during the fifth overload phase (E), there were 48 profiles.

Initial Link. During the initial link, the participant was presented with a screen telling them that on the next screen, there will be X profiles, and they were asked if they want to choose the best from the profiles (Choice), if they would like the computer to choose the best from the profiles (No-choice), or if they would like to see a blank screen (Control). They chose and proceeded accordingly.

Terminal Link. During the terminal link, the procedures were based upon the participant's choice from the initial link.

Choice. During a choice terminal link, the previously specified number of profiles were presented, and the participant was provided time to select the best option by clicking on that profile picture. Once the participant selected their desired partner, they proceeded to the satisfaction and confidence rating.

No-choice. During the no-choice terminal link, the participant was presented with a single profile, or the "computer's choice" of the best option, and they then proceeded to the satisfaction and confidence rating.

Control. During the control terminal link, the participant was presented with a blank screen and then proceeded to the satisfaction and confidence rating.

Satisfaction Rating. During the satisfaction rating, the participant was prompted to rate their satisfaction with either (a) their choice, (b) the computer's choice, or (c) the blank screen based on a 100-point Likert rating scale in which 1 equates to "Absolute Dissatisfaction" and 100 equates to "Absolute Satisfaction."

Confidence Rating. During the confidence rating, the participant was prompted to rate their confidence that either (a) their choice, (b) the computer's choice, or (c) the blank screen was the best option based on a 100-point Likert rating scale in which 1 equates to "Absolute Doubt" and 100 equates to "Absolute Confidence." After completing the confidence rating, the trial ended and the initial link for the next trial began.

Ethical Assurances

No identifying participant information was collected. This means no names, no IP addresses, no emails, and so forth. Therefore, anonymity of participation can be guaranteed as potentially sensitive and private personal information was collected. All data were collected and are stored in a secure password protected online file that is only accessible by me and the dissertation chair. Data will be kept for a minimum of 7 years.

Chapter 4: Findings

The following chapter presents the results of the present study. Group designs were used, so group analyses were utilized to report results. In general, α was set to .05 for significance, meaning there is a less than 5% chance that any result that reaches significance may be due to a Type I error. Keep in mind that because the nature of the research is behavior analytic in nature, visual inspection will also be used in Chapter 5 when discussing the results reported here.

Results

Males versus Females

Independent samples t tests were used to compare group means for differences for males ($N = 26$) and females ($N = 50$). There were significant differences in lifetime sex partners, $t(74) = 4.085, p < .001$. Males ($M = 35.63, SD = 33.775, SE = 6.894$) reported significantly more lifetime sex partners than females ($M = 13.84, SD = 11.926, SE = 1.687$). There were significant differences in total sexual risk, $t(74) = 2.024, p < .047$, where males showed significantly elevated sexually risky behavior ($M = 21.54, SD = 18.401, SE = 3.609$) than females ($M = 14.68, SD = 11.123, SE = 1.573$). A significant difference existed in the financial prospect break point, $t(74) = 3.564, p < .001$, and the significant break point, $t(74) = 2.847, p < .005$, where males showed more inelastic demand ($M_{break} = 5.38, SD = 3.188, SE = .625; M_{significant} = 3.73, SD = 2.442, SE = .749$) than females ($M_{break} = 2.82, SD = 2.862, SE = .405; M_{significant} = 2.18, SD = 2.116, SE = .299$). There were also differences in the AUC for altruism, $t(74) = 3.321, p < .001$, where males showed stronger demand ($M = .001969, SD = .004002, SE = .000785$) than females ($M = .000087, SD = .000365, SE = .000052$). This same difference existed in the AUC for financial prospect, $t(74) = 3.17, p < .002$, where males showed stronger demand for sex ($M = .003776, SD = .008433, SE = .001654$) than females ($M = .000018, SD = .000084, SE =$

.000012). There was also a difference in AUC for intelligence, $t(74) = 1.969, p < .05$, where males again showed more demand for sex ($M = .002087, SD = .004279, SE = .000839$) than females ($M = .000599, SD = .002338, SE = .000329$). No differences were found between males and females in rejection sensitivity, $t(74) = -1.724, p < .089$, nor in app confidence, $t(74) = -0.503, p < .616$. Displayed in Figure 3, when observing sex as a commodity for consumption irrespective of attribute, males showed significantly more demand for sex than females at one date, $t(302) = 8.453, p < .001$, two dates, $t(302) = 7.537, p < .001$, three dates, $t(302) = 6.065, p < .001$, five dates, $t(302) = 4.037, p < .001$, 10 dates, $t(302) = 3.672, p < .001$, and 20 dates, $t(302) = p < .033$, and this was further highlighted by differences in AUC measures, $t(302) = 4.156, p < .001$. Males also showed persistence for sex as there were significant differences for breakpoints across all partners regardless of high or low variables, $t(302) = 3.502, p < .001$.

Dating App Users versus App Abstainers

Independent samples t tests were used to compare group means for differences for dating app users ($N = 36$) and app abstainers ($N = 40$). No differences existed for lifetime sex partners, $t(72) = 1.277, p < .206$, or for rejection sensitivity, $t(74) = -.704, p < .484$. A significant difference existed for sexual risk, $t(74) = 2.475, p < .016$, where dating app users ($M = 21.17, SD = 15.257, SE = 2.543$) had significantly elevated risk compared to app abstainers ($M = 13.3, SD = 12.416, SE = 1.963$). This was further echoed when broken down by historical app status $F(2,73) = 3.51, p < 0.035$, where those who currently use dating apps ($N = 36, M = 21.17, SD = 15.257, SE = 2.543$) showed significantly elevated risk than those who have previously used dating apps but do not currently use ($N = 31, M = 14.42$), and those who have truly abstained from app use ($N = 9, M = 9.44$). Differences for the financial prospect break point was noted, $t(74) = 2.518, p < .014$, as dating app users showed more inelastic demand ($M = 4.64, SD = 3.39$,

$SE = .565$) than app abstainers ($M = 2.85$, $SD = 2.797$, $SE = .442$). Significant differences were found in the AUC for altruism, $t(74) = 2.358$, $p < .021$, as dating app users showed stronger demand for sex ($M = .001422$, $SD = .003494$, $SE = .000582$) than app abstainers ($M = .000109$, $SD = .00044$, $SE = .00007$). This was echoed in the case of intelligence, $t(74) = 2.108$, $p < .038$, as dating app users reported stronger demand for sex ($M = .001902$, $SD = .004002$, $SE = .000667$) than app abstainers ($M = .000393$, $SD = .002009$, $SE = .000318$).

When treating each viewed partner as an independent participant, significant differences existed between dating app users ($N = 144$) and dating app abstainers ($N = 160$). Displayed in Figure 4, those reporting currently using dating apps reported higher motivation for sex at one date, $t(302) = 4.645$, $p < .001$, two dates, $t(302) = 4.062$, $p < .001$, three dates, $t(302) = 4.604$, $p < .001$, five dates, $t(302) = 4.274$, $p < .001$, and 10 dates, $t(302) = 3.126$, $p < .002$. Individuals using dating apps ($M = .001919$, $SD = .00539$, $SE = .000449$) also reported greater AUC, $t(302) = 3.153$, $p < .002$, than those abstaining from dating apps ($M = .000409$, $SD = .002618$, $SE = .000207$), and a significantly more inelastic demand, $t(302) = 2.526$, $p < .012$, was reported in those using dating apps ($M = 4.923$, $SD = 3.601$, $SE = .3$) than by those abstaining from dating apps ($M = 3.906$, $SD = 3.42$, $SE = .27$). Displayed in Figure 5, when looking at sexual demand differences between male dating app users ($N = 64$), male app abstainers ($N = 40$), female dating app users ($N = 80$), and female app abstainers ($N = 120$), 2-way ANOVA measures revealed significant interaction effects where male dating app users showed increased demand for sex at one date, $F(1,300) = 8.225$, $p < .004$, two dates, $F(1,300) = 5.216$, $p < .023$, three dates, $F(1,300) = 10.666$, $p < .001$, five dates, $F(1,300) = 10.348$, $p < .001$, 10 dates, $F(1,300) = 10.585$, $p < .001$, and 20 dates, $F(1,300) = 4.166$, $p < .042$. There was a significant interaction effect for the

AUC, $F(1,300) = 9.846, p < .002$. There was no interaction effect for break point or significant break point.

High versus Low Attribute Sexual Demand and Elasticity

Independent samples t tests were used to compare group means for differences for group one ($N = 31$) and group 2 ($N = 45$) regarding sexual demand and elasticity for identified high and low attributes. No differences between high and low groups for altruism (Figure 6), financial prospect (Figure 7), or social status (Figure 9) were found regarding breakpoints, and no differences between high and low groups for AUC were found across attributes. Significant differences were found in high versus low intelligence, $t(74) = 3.035, p < .003$. Displayed in Figure 8, those viewing partners displaying high intelligence ($M = 5.36, SD = 3.432, SE = .512$) showed more inelastic demand for sex than those viewing partners displaying low intelligence ($M = 2.9, SD = 3.506, SE = .63$). Significant differences were also found in the significant break point partner intelligence, $t(74) = 3.361, p < .001$, where those seeing partners displaying high intelligence showed continued inelastic demand for sex ($M = 4.2, SD = 2.865, SE = .427$) than partners displaying lower intelligence ($M = 2.1, SD = 2.385, SE = .428$).

Demographic Differences

One-way ANOVAs were used to determine differences for demographic factors. No significant differences were found for any measure under ethnicity, highest education, nationality, income level, political leaning, or identified religion. There were significant differences based on reported sexual orientation, $F(2,71) = 3.886, p < .025$, as individuals identifying as homosexual ($N = 6, M = 44$) reported significantly more lifetime sexual partners than both heterosexual ($N = 55, M = 20.25$) and bisexual individuals ($N = 13, M = 13$).

Correlations

Kendall's Tau- b was used regarding sexual risk as this is an ordinal measure, and Pearson's r was used across all other measures.

Total Sample

Regarding sexual risk, correlations existed for lifetime sex partners, $r_{\tau} = .277, p < .001$, and app confidence, $r_{\tau} = .299, p < .012$. A correlation existed between age and rejection sensitivity, $r = -.227, p < .048$, where older individuals were less sensitive to rejection than younger individuals. App confidence was correlated to age, $r = -.393, p < .018$, where older individuals were less confident on dating apps.

Males versus Females

For females, the only significant correlation was sexual risk being correlated to rejection sensitivity, $r_{\tau} = .333, p < .043$, as females who are more sensitive to rejection reported more sexually risky behavior. For males, total lifetime sexual partners was correlated to rejection sensitivity, $r = .452, p < .027$, as males who have more sexual partners are more sensitive to rejection. Sexual risk was correlated to lifetime sex partners, $r_{\tau} = .399, p < .007$, where males who had more sexual partners reported more sexually risky behavior. Sexual risk was also correlated to app confidence, $r_{\tau} = .407, p < .03$, as males who reported more confidence on apps reported more risky sexual behavior.

Dating App Users versus App Abstainers

For dating app users, sexual risk was significantly correlated to total lifetime sex partners, $r_{\tau} = .279, p < .021$, as users with more sexual partners reported more sexually risky behavior. Sexual risk was also correlated to app confidence, $r_{\tau} = .299, p < .012$, where those reporting more confidence while using dating apps also reported more sexually risky behavior. App

confidence was significantly correlated to age, $r = -.393$, $p < .018$, as older individuals report less confidence on dating apps. For dating app abstainers, sexual risk was correlated to lifetime total sex partners, $r_t = .328$, $p < .004$, where those with more lifetime sex partners reported more sexually risky behavior.

Choice Overload

Figure 10 displays the proportion the group of participants ($N = 104$) chose between choice, no choice, and control. As array size increased, participants were more likely to elect not to choose. At three partners, 77.1% of trials resulted in choice. At six partners, 83.03% of trials resulted in choice. At 12 partners, 76.3% of trials resulted in choice. At 24 partners, 61.2% of trials resulted in choice. Finally, at 48 partners, 42.03% of trials resulted in choice. Figure 11 displays the overall satisfaction and confidence across all conditions. No significant differences existed across satisfaction or confidence as array size increased.

Independent group t tests were used to determine satisfaction and confidence mean differences. Figure 12 displays the satisfaction differences between choice and no choice. In general, participants were more likely to report higher satisfaction levels when electing to choose, as 14 out of 24 trials were significant at the $p < .05$ level. Figure 13 displays the confidence differences between choice and no choice. In general, participants were more likely to report higher satisfaction levels when electing to choose, as 14 out of 24 trials were significant at the $p < .05$ level. Figure 14 displays the satisfaction between males and females. Males tended to be more satisfied with their choices than females, as they reported higher satisfaction in 22 out of 24 trials, eight of which reached statistical significance at the $p < .05$ level. Figure 15 displays the confidence between males and females. Males were marginally more confident with their

selections as 13 out of 24 trials saw males reporting more confidence, three of which reached significance at the $p < .05$ level.

Dating app users tended to be more satisfied with their choices, as 23 out of 24 trials saw dating app users reporting higher satisfaction with their choices, displayed in Figure 16; however, only three of these trials reached statistical significance at the $p < .05$ level. Displayed in Figure 17, dating app users also tended to be more confidence with their choices, as 19 of 24 trials saw app users reporting higher confidence, seven of which reached significance at the $p < .05$ level. When average satisfaction and confidence was taken across trials, app confidence was significantly correlated to total satisfaction, $r = .347, p < .041$, but not total confidence, $r = .257, p < .135$. Total satisfaction was significantly related to total confidence, $r = .779, p < .001$.

Regarding significant correlations across participants, when taking average satisfaction across choice conditions, satisfaction was significantly negatively correlated to rejection sensitivity, $r = -.303, p < .011$, where those who were less sensitive to rejection were more satisfied with their selected partners. Sexual risk was also weakly but significantly correlated to total satisfaction, $r = .165, p < .046$. Sexual risk was not related to confidence.

Chapter Summary

Differences existed between males and females regarding the value of sexual activity in general where males reported stronger and more inelastic demand for sex. Females' reports of sex were more influenced by accentuated high and low variables, particularly for intelligence and financial prospect. Males also reported increased sexual risk. Online daters reported significantly stronger and more inelastic demand for sex, as well as increased sexual risk, compared to those abstaining from online dating use. Significant correlations were also found in the sample. Regarding choice and choice overload, as array size increased, participants elected to defer their

ability to choose. No differences in satisfaction or confidence existed between array sizes. Males and online daters tended to be more confident and more satisfied with their choices.

Chapter 5: Summary, Conclusions, and Recommendations

The present chapter discusses the results. First, a discussion of the elasticity of demand will take place, and how the differences found between males and females may influence the behavior of those seeking the company of males and females. Next, an analysis of choice and choice overload will be discussed, and how this may fit into the culture of online dating. Reasons for the lack of differentiation between satisfaction and confidence measures are also discussed here. Finally, the limitations of the present study and ideas for future research are presented.

Interpretation of Findings

Elasticity of Demand

The results of the present study add to the limited body of research with sexual demand and elasticity (Dolan et al., 2020; Jarmolowicz et al., 2016a), suggesting that sex can be studied under the behavioral economic framework considering it a commodity for consumption. Regarding sexual demand and elasticity of sexual demand, the results support that there may be gender differences in sexual demand, and this may be due to biological or innate preference. Echoing the evolutionary psychological hypothesis, males were hypermotivated for sex (Buss, 1989, 2003; Carroll et al., 1985; Trivers, 1972). More consumption of hypothetical sex was reported across partners regardless of accentuated variable (see Figure 3), sex was statistically significantly consumed more at one, two, three, five, 10, and 20 dates irrespective of variable, and AUC measures were significantly higher for three out of four partners irrespective of accentuated variable, suggesting that males may view sex under the paradigm of reinforcement pathology (Jarmolowicz et al., 2016b).

Reinforcement pathology assists in understanding suboptimal health related behavior, particularly areas of addiction. Because sex was reported to be consumed at such a high rate at

low unit prices for males, and males showed more inelastic demand for sex across partners, it suggests males may be so motivated for sex that sex seeking behavior may parallel that of drug addiction. Ignoring an increasing unit price for a commodity is the hallmark of behavioral economic addiction (Jarmolowicz et al., 2016b; MacKillop, 2016), and in the present study males continued to report responding for sexual activity at higher behavioral unit prices well beyond females, across partners, and irrespective of high or low accentuated attribute. Reinforcement pathology for sex in males may also explain why males showed significantly more sexual risk than females, as their hypermotivation for sex and sexual activity may more predictably lead to engaging in risky sexual behavior. In this sense, potential sex with a female may be so motivating that the establishing operation for sex may increase the value of sex and greatly increase the likelihood of evoking sex seeking behavior at the expense of safe sexual behavior.

Under simple mate selection the results of the present study suggest that it doesn't matter how altruistic, intelligent, socially savvy, or financially prosperous a potential partner might be for males, all that seems to matter is that they are a moderately pretty face. There were differences in the elasticity of sex for a financially prosperous partner, so though males may show preference for physical attractiveness and sex overall, they prefer to continue to engage in sexual activity with a financially prosperous partner. What does this mean for individuals who prefer the company of males, do the results of the present study reinforce depressingly old stereotypes that males ignore other variables and view females as mere sex objects? Perhaps, but it is important to remember that this preference may be rooted in the evolution of males, as a slender build denotes higher metabolism and represents fertility for males (Buss, 2003; Trivers, 1972), and cultural factors can greatly influence this overt preference for physical attractiveness

and sexual prowess (Ahrold & Metson, 2010). It is also important to remember that these are group studies, and the results represent the average many participants, so not all males may respond with such a hypermotivation for sex and sexual activity, nor may they respond to the signal of sexual behavior under reinforcement pathology. The benefit is that those seeking the company of males may be who they want to be; meaning, they may be as candid as they like with how they overtly present themselves, as it likely will not deter a potential mate.

Regarding females, sex was not consumed at the same levels as males, and compared to males, sex was an elastic commodity in general, confirming previous studies suggesting that females may not be as highly motivated for sexual activity (Carroll et al., 1985; Buss, 1989; Buss, 2003; Davis, 1990; Mardhekar & Aradhye, 2010; Li et al., 2002; Pawlowski & Dunbar, 1999, 2001; Sprecher et al., 1994). Under the evolutionary perspective of psychology, this is to be expected from females as sex and sexual prowess is not typically a prioritized attribute in females (Buss, 1989, 2003; Carroll et al., 1985; Li et al., 2002; Trivers, 1972). The attribute that did greatly influence sexual activity, however, was intelligence, supporting previous literature (Buss, 1989, 2003; Buss & Schmitt, 1993; Carroll et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994). Though statistical significance was not reached due to a high amount of variability, visual inspection would ascertain that intelligence certainly mattered in sexual selection (Figure 8). Those seeing high intelligence reported consumption of sex at higher rates, and sex remained significantly more inelastic compared to those seeing a partner with low intelligence.

A longitudinal study supports the notion that females, particularly physically attractive females, prioritize intelligence in partners (Dunkel et al., 2019). In 1957, female high school seniors in Wisconsin took their senior year photos, and in 2018 their husbands were tested on

their intelligence using intelligence quotient (IQ) scores. Specifically, those females who were judged as more physically attractive by independent raters were more likely to have more intelligent husbands according to IQ scores (Dunkel et al., 2019), supporting the hypothesis posited by evolutionary psychology (Buss, 1989, 2003; Buss & Schmitt, 1993) that they may engage in intelligent partner seeking behavior.

The intelligence of a man, and the priority intelligence has for females has been gaining evidence. Aspara et al. (2018) investigated the relationship between intelligence and relationship success of over 200,000 Finnish men aged 18–45. Data were accessed from the Finnish Defense Forces to report intelligence for each participant on a 120-item test. Each male was followed for 5 years, during which time their government marital records were accessed to determine relationship success. Findings were that indeed intelligence and relationship success were related, with the proportion of males getting married and staying married increased as intelligence increased.

Why might intelligence be so attractive for females? According to Gignac et al. (2018), intelligence may be attractive in its own right, but it may also be attractive as it often correlates to high income (Aspara et al., 2018). However, according to Gignac et al., though females report being more physically attracted to a more intelligent partner than males, males report a higher average intelligence as more attractive. It may be that for females, their partner does not have to be a genius to be considered attractive; rather, they just have to not be unintelligent.

This information and the results of the present study should guide the behavior of those seeking the romantic and sexual company of females. Female partner seekers should display themselves in an intelligent light and asking intelligent questions that signal not just interest but also responsiveness and understanding (Gignac et al., 2018). Individuals may also display their

university, degree, and occupation more prominently if more prestigious (Aspara et al., 2018; Gignac et al., 2018). Intelligence may be intertwined in more than educational and occupational practices, and single individuals may advertise other researched markers of intelligence such as learning/playing an instrument (Schellenberg, 2004), reading books (Ritchie et al., 2015), and finding simple enjoyment in activities (Mcelroy et al., 2015). Along with this, individuals seeking the company of females may also simply avoiding markers of unintelligence such as obesity (Chandola et al., 2006) and smoking (Weiser et al., 2010).

For females, financial prospect (Figure 7) also somewhat influenced the reported sexual motivations as those displaying high financial prospect reported consumption of sex approximately 4 times more than those seeing a partner displaying low financial prospect, and sex may be more inelastic when presented with a partner displaying high financial prospect as this was approaching significance. Though not a statistically significant replication of previous research (Buss, 1989, 2003; Buss & Schmitt, 1993; Carrol et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994), this still warrants discussion based on visual inspection.

It is not surprising that females seeing a partner displaying higher financial prospect reported more sexual activity, as well as more inelastic demand for a partner with high financial prospect. A study by Wang et al. (2018) suggested that females are more likely to rate males as more attractive after they are informed of the males' financial prospect. Over 300 males and females were asked to rate pictures of the opposite sex based on their attractiveness on a scale from 1 (*unattractive*) to 10 (*attractive*). After initial ratings were given, salary information was added to each picture, and each participant was asked to rerate the pictures. Females were 4 times more influenced by the salary information than males, and were more likely to change their

rating of attractiveness based on reported financial prospect, particularly when viewing a high salary, as ratings increased by an average of two points when viewing a partner with high financial prospect. Research suggests that females are also more likely to report that they prefer an attractive male make at least as much money as they do. Fales et al. (2016) surveyed 28,000 heterosexual males and females between aged 18 and 75 on their partner preferences. Females were more likely to prioritize that males make at least as much money as they do (46% for females; 24% for males) and have a successful career (61% for females; 33% for males), while males were more likely to prioritize that females have a slender body (80% for males; 58% for females).

Reasoning for the attractiveness of high financial prospect comes from the parental investment hypothesis (Trivers, 1972) suggesting that a male with more resources, in this case money, can be invested in both the female and her potential offspring, increasing the chances of survival for both her and her offspring. It is also possible that this idea of money being attractive for females has been ingrained in popular culture (Hamblin, 2014). There are references in iconic movies such as *Scarface* (De Palma, 1983), "...You gotta make the money first. Then when you get the money, you get the power. Then when you get the power, then you get the women," and there are references in popular song such as *Girls & Boys* (Madden & Madden, 2003), "Girls don't like boys. Girls like cars and money," among many others. Repeated presentations of these ideas may reinforce the notion that rich males are more attractive, influencing those with rule governed behavior, influencing the mate selection of the female toward wealthier men. Though according to previously mentioned studies (Aspara et al., 2018; Gignac et al., 2018), financial prospect and intelligence may go hand in hand, as intelligence and financial prospect may be related, hence a wealthier male may signal an intelligent male.

Guiding the behavior of those seeking the company of females, markers of a high financial prospect should be advertised. Overtly advertising salary (Wang et al., 2018) may not necessarily be warranted, but advertising attributes that correlate to higher salary may be fruitful such as occupation or make, model, and year of car (Aspara et al., 2018). As discussed, intelligence and financial prospect may be correlated, so following suggestions related to bolstering intelligence (Chandola et al., 2006; Mcelroy et al., 2015; Ritchie et al., 2015; Schellenberg, 2004; Weiser et al., 2010) may also assist in attracting females.

Under a lens of behavior analysis, it is understood that sex is a primary reinforcer (Skinner, 1953), but the way males and females approach and court that reinforcer is very different (Spar, 2020), and this may be due to evolutionary differences (Buss; 2003; Buss & Schmitt, 1993; Trivers, 1972). Because sex is viewed so differently, and the results of the present study suggest that different factors may influence sexual motivations between males and females, it is possible that there are different establishing and abolishing operations for sex between males and females. For males, a physically attractive face may establish sex with that partner as reinforcing and evoke behavior that may result in sexual activity with that partner. Any extra observed variable such as high intelligence or low financial prospect may be nothing more than a neutral stimulus regarding sex seeking. For females, on the other hand, a physically attractive face may be a motivating operation for sexual activity, but the degree to which that motivating operation is establishing or abolishing depends on the presence of certain discriminative stimuli. The results of the present study suggest that high intelligence and high financial prospect may be an establishing operation for sexual activity, while low intelligence and low financial prospect may be an abolishing operation for sexual activity. Sex is a primary

reinforcer; however, the degree to which that primary reinforcer is reinforcing may be biologically dependent.

For both males and females, this evolutionary phenomenon mate selection preferences may hold true even later in an adult's life. Alterovitz and Mendelsohn (2009) analyzed internet personal ads from four different age groups, 20–34, 40–54, 60–74, and 75+ years old to determine if males and females differed in their partner seeking across ages. Results supported the theory posited by evolutionary psychology across age groups; Male ads were more likely to report prioritizing a physically attractive partner, and offered status-related information such as occupation, social standing, and financial prospect. Female ads were more selective and reported prioritizing status-related variables. Males were also more likely to report desiring increasing younger females than themselves as their own age increased. Furthering these outcomes, Menkin et al. (2015) identified the prioritized goals of a new relationship between males and females. Over 5,400 new eHarmony users completed a questionnaire, and the results supported the theory posed by evolutionary psychology; males placed greater emphasis on sexual attraction than females at all ages, while females placed greater emphasis on efforts of communication than males at all ages. Indeed, it would appear that males and females, whether they are aware of their behavior or not, continue to conform to motivations rooted in evolution, viewing females as sex objects and males as success objects (Davis, 1990). With the rise in the popularity of dating apps (Fortune, 2021; Iovine, 2020; Link, 2021; Spar, 2020), it is important to discuss the impact using dating apps may have on sexual demand and elasticity.

Dating Apps

In the present study, dating app users (Figure 4), particularly male dating app users (Figure 5), showed both increased demand for sex at lower date prices as well as increased

sexual risk compared to those abstaining from dating app use. The stark increase in sexual motives and reported sexual consumption on dating apps confirms previous research suggesting individuals with higher sexual motivations may be more likely to use dating apps (Alexopoulos et al., 2020; Hobbs et al., 2017; Sawyer et al., 2018), and the increased consumption by males on dating apps confirms that males may be more motivated to use dating apps as a means of sex seeking (Gatter & Hodkinson, 2016; Guadagno et al., 2012). Combining this with the evolutionary perspective of psychology regarding males prioritizing physical attractiveness and sex in potential partners (Buss, 1989, 2003; Buss & Schmitt, 1993; Trivers, 1972), the results suggest that males may view dating apps as another tool in the evolutionary tool belt to facilitate the behavior of finding sex and expedite the consumption of sex (Slater, 2013; Spar, 2020; Valkenburg & Peter, 2007). Dating apps may then influence the reinforcement pathology of sex, as the link to increased sexual risk supports the idea that behavioral persistence and increased consumption of sex as a reinforcer may be related to makers of suboptimal sexual health behavior, confirming previous studies related to the impulsiveness of sexual consumption (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2015; Lemley et al., 2017; Sweeney et al., 2019). The question that still remains, however, is as follows: Are individuals with higher sexual motivations more likely to use dating apps, or do dating apps reinforce and evoke sex seeking behavior? At this time, this question is unable to be answered, but with the rising use of dating apps the answer may be needed sooner than later.

In the present sample, 47.4% reported currently using dating apps and 88.2% of the total sample reported having had at least some experience, leaving 11.8% of the sample with having had absolutely zero experience with an online mate selection experience. A large portion of individuals using dating apps is not surprising as dating apps experienced a boom in new users

during the Covid-19 pandemic of 2020 (Fortune, 2021; Iovine, 2020; Link, 2021). In March 2020, Tinder® recorded its highest daily swipe count at 3 billion (Fortune, 2021), OkCupid grew by 21% (Iovine, 2020), Match.com saw a 15% increase in new subscribers (Link, 2021), Bumble grew by 16% (Fortune, 2021), and first-time video dates on Bumble increased by over 70% (Fortune, 2021). It is possible that as the Covid-19 pandemic raged on and isolation continued, people sought intimacy in easiest and most convenient way possible, through dating apps (Iovine, 2020).

Sexual health, and general public health during the pandemic have been the forefront of discussion in both political and social debates. Regarding dating app use, badging (displaying date preference icons) and health precautions were added to some apps that were instrumental in maintaining safe interactions and safe sexual health (Link, 2021). Because of the high levels of sexual risk of dating app users, particularly by males, and the finding that those who think they are successful on dating apps (dating app success; Alexopoulos et al., 2020) may show more predictably risky sexual behavior, it may be advisable to continue this feature on dating apps to improve sexual health, particularly preventing the spread of Covid-19 and STIs. Since 2014, there has been a 19% increase in diagnoses of chlamydia, a 63% increase in the diagnosis of gonorrhea, and a 71% increase in the diagnosis of syphilis (Centers for Disease Control and Prevention, 2020), so identifying stimuli that may increase precautions for sexual health may be beneficial to identifying successful online interventions in promoting sexual health and health in general. If STIs continue to rise, dating app users, especially males, may find themselves particularly at risk. The need for improving sexual health is more alarming when accompanied by the finding in the present study that males may respond to sex under a paradigm of

reinforcement pathology. In identifying this, health precautions may be specifically targeted toward males such as appropriate condom use or STI information.

The pandemic appears to have shaped behavior and permanent products of dating, as according to Match's (2021) *Singles in America* study, 58% of American's are now prioritizing dating app use to find a relationship, 63% spending more time engaged with partners on dating apps, and 70% reporting they are now more honest with their intentions. It would appear that the pandemic has led single individuals to spend more time dating virtually before moving to more serious in-person encounters (Iovine, 2020). According to Iovine (2020), singles are prioritizing predate online communication before meeting in person, and this may lead to less risky behavior. However, the present study along with previous studies involving sexual risk and dating apps (Bable & Ackerlund Brandt, 2021) suggests that those using dating apps are at significantly higher sexual risk than their app abstaining counterparts, suggesting that further efforts may be required in order to better mitigate sexual risk taking among users.

Dating apps may have thousands of partners available at any given time (Spar, 2020). A large number of partners available on dating apps may lead to uninformed decisions and has the user at risk of objectifying potential partners and being less open to commitment (Finkel et al., 2012; Wiederhold, 2015). With the increase in dating app use reported in the present study and in previous research (Fortune, 2021; Iovine, 2020; Link, 2021), it is important to discuss the role choice overload may have on mate selection.

Choice Overload

The results of the present study add to the limited current research regarding choice and dating apps (D'Angelo & Toma, 2017). As the array of partners increased, individuals elected to forfeit their ability to choose; confirming previous literature suggesting that as the array size

increases, the preference for making a choice decreases (Reed et al., 2011). Individuals electing to defer their choice as array size increased yet still electing to have a partner displayed to them suggests that dating applications that present “ideal matches” such as Hinge, or that filter “best matches” such as eHarmony or Match, may be using best practice. Individuals may not want to make a choice from a large pool of potential partners presented at once, but they may still want to be provided with at least one potential partner rather than none.

An interesting finding that is contradictory to previous literature resides in satisfaction and confidence with choices. Previous studies have suggested that as array size increases, satisfaction with choices decreases (Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Schwartz, 2004); however, the present study did not replicate these findings. No significant differences were observed between differing array sizes overall, or between choice, no-choice, and control groups. What might account for this? It is possible that the mix of attractive versus unattractive options is responsible. As mentioned previously, a study by Chan (2015) had two groups of participants choose a documentary to watch between either a list of all attractive options or a list of unattractive options. Ratings of satisfaction with their final choice revealed that satisfaction decreases when making a choice between simultaneous attractive decisions, and satisfaction increases when making a choice between simultaneous unattractive options.

The reasoning being that too many attractive options may lead to regret from missing out on another potentially more satisfying option (Baron & Rivot, 1994; Gilovich & Medvec, 1995), but having unattractive options present may have the reverse effect by highlighting the strengths of the chosen option (Chan, 2015). The present study contained a mix of both attractive and unattractive options, emulating the true online dating app experience, and perhaps the presence

of unattractive options allowed participants to highlight the strength of their chosen option. Satisfaction was low in general ($M = 57.39$), indicating that, overall, participants showed only moderate satisfaction across partner arrays. This was echoed in the case of being confident that selected partners were in fact the best choice compared to other partners presented ($M = 53.82$). It is possible that with the limited research on choice overload and online dating that potential romantic partners as a commodity for choice functions differently than other consumable commodities. There may be greater cognitive and physiological effort when deciding between potential mates and this may impact subjective measures of satisfaction and confidence (Saltsman et al., 2019). Choice regret (Iyengar & Lepper, 2000; Schwartz, 2004) may also be more pronounced for single individuals making a choice between hypothetical partners, as making an incorrect choice could result in the expense of a sexual or relationship experience.

The presence of profile data may also emulate counterfactual thinking, which implies that having more choices with more information evokes thoughts about the positive future outcomes that could have been had the discarded alternatives been chosen (Hafner et al., 2012). The addition of profile information may serve as extra information for participants to process, increasing cognitive effort expense (Saltsman et al., 2019), enhancing choice complexity. In this sense, the number of choices in a set is multiplied by the number of attributes for each choice, and with varying pieces of information on each profile, it is possible that the choice complexity increased the cognitive burden on participants (Greifeneder et al., 2010), reducing overall satisfaction levels.

Reduced and undifferentiated satisfaction appears to be in line with some previous research regarding online dating. Lenton and Stewart (2008) asked single females to select a preferred partner out of an array of four, 24, or 64 dating profiles, to which satisfaction ratings

did not significantly differ between array sizes. It is possible that unlike research into choice and satisfaction with other commodities that are easily and immediately consumable such as chocolates (Iyengar & Lepper, 2000), dating and sex partners are an experience that unfold over time, and this increased lag-time between making a choice and consumption of a romantic/sexual partner may affect satisfaction and confidence when one cannot immediately consume after making a choice (D'Angelo & Toma, 2017). The undifferentiated satisfaction and confidence outcomes in the present study are consistent with the line of thinking in D'Angelo and Toma (2017) that in online dating, choice overload effects may not immerse immediately after the choice is made, but rather after a period of time has elapsed (p. 6).

Those using dating apps tended to be more satisfied and confident with their partners compared to those abstaining from dating app use, and this satisfaction was correlated to app confidence measures. It may be that using dating apps reinforces selecting a partner from a large array due to practice effects of repeated presentations of partner selection, and history of perceived reinforcement. Research by Sharabi (2020) suggested this may be the case, as 108 single individuals were randomly assigned to see either a dating profile or a no-profile hypothetical partner. Outcomes reported that those viewing profiles increased eagerness to communicate in person and increased the satisfaction ratings during communication. Dating app users may also show sexual motivations (Alexopoulos et al., 2020; Hobbs et al., 2017; Sawyer et al., 2018), so increased satisfaction in dating app users may be in line with motivations for satisfaction with any hypothetical sexual gratification, particularly when previous experiences in selecting a partner from an array has been positively reinforced with sexual activity. Dating app users selecting from an array may be a setting event in which making a choice between partner

profiles has been paired with sexual gratification, increasing the satisfaction outcomes with the tasks.

Males also tended to be more satisfied and confident with their choices than females. This may be due to the sexual motivations that are held by males regarding general mate selection (Buss, 1989, 2003; Buss & Schmitt, 1993; Carrol et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994). Studies in delay discounting have suggested that males show preference for small immediate sexual activity over delayed longer sexual activity (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2014, 2015; Lawyer & Schoepflin, 2013; Sweeney et al., 2019), and results from the present study regarding sexual demand and previous studies regarding sexual demand (Dolan et al., 2020) indicate that males report higher consumption and more inelastic demand for sexual activity, suggesting increased sexual motivation (Baumeister et al., 2001). Males' high motivations for sex may account for the increased satisfaction and confidence measures compared to females as the primary desired outcome for males may be sex, and it may not be so for females. Females may prefer intelligence (Buss, 1989, 2003; Buss & Schmitt, 1993; Carrol et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994), high financial prospect (Buss, 1989, 2003; Buss & Schmitt, 1993; Carrol et al., 1995; Davis, 1990; Feingold, 1990; Hughes et al., 2020; Mardhekar & Aradhye, 2010; Schmitt et al., 2001; Sprecher et al., 1994), altruism (Arnocky et al., 2017), social status (Pawlowski & Dunbar, 1999, 2001), and confidence (Alexopoulos et al., 2020; Timmermans et al., 2018) over sex and physical attractiveness, all of which may require more time to make a determination of satisfaction in a partner (D'Angelo & Toma, 2017).

Limitations

The present study is not without limitations. First, the length of the study may have led to survey fatigue (Sinickas, 2007). Survey fatigue may have led to inaccurate answers from potential boredom and cognitive fatigue due to repeated questions. There were up to 169 questions across all parts of the procedures, and one quarter of all participants eclipsed 45 min when completing the survey, potentially jeopardizing responses due to potential fatigue. Separating choice measures and demand elasticity measures may have sought to rectify this and improve attending across tasks.

Second, all questions posed within the current study were purely hypothetical in nature and did not result in immediate, nor delayed sexual gratification, nor the culmination of the selected partner in choice measures. Therefore, caution is encouraged as what participants *report* versus how participants respond/consume sexual activity may not correlate. However, research regarding the delay discounting of real monetary outcomes has been shown to resemble that of hypothetical monetary outcomes (Dixon et al., 2013; Johnson & Bickel, 2002), and this was replicated under hypothetical and real-world sexual outcomes (Sweeney et al., 2019). In combination with the support for the heritability of discounting (Anokhin et al., 2011, 2015; Odum, 2011) and the evolutionary perspective of psychology regarding sex (Buss, 2003; Buss & Schmitt, 1993, Trivers, 1972), it suggests that there may be little discrepancy if actual sexual outcomes were made available.

Third, there were a limited number of male participants in the present study, making gender-based conclusions difficult to confirm. A limited number of males is no new territory for behavioral economic accounts of sex (Jarmolowicz et al., 2014, 2015, 2016a; Lawyer & Schoepflin, 2013). However, studies with more evenly distributed samples of males and females

have supported similar outcomes in the field of behavioral economics (Collado et al., 2017; Dariotis & Johnson, 2015; Dolan et al., 2020; Sweeney et al., 2019), suggesting that results of the present study may still bear weight.

Finally, all participants were recruited and completed procedures during the Covid-19 pandemic. The recommended socially distanced lifestyle during the Covid-19 pandemic may have deprived single individuals of sexual contact for such long periods of time that it may have influenced the demand for sex (Lehmiller et al., 2020) and the willingness to make an informed choice in sexual partner. However, it is possible that an increase in sex media use such as internet pornography may have reduced levels of deprivation, acting as a substitute commodity through masturbation (Petrychyn, 2020). Along with this, according to a survey done by Match (2021) during the Covid-19 pandemic, one quarter of single adults reported having sexual intercourse with their roommate, with 46% of Generation Z and 33% of Millennials reporting this. With the substitution of masturbation and roommates, it is unlikely true sexual deprivation affected the reported results.

Future Research

Future research should seek to rectify the limitations presented above. First, and as described above, replication of demand elasticity and choice measures should be completed with more males in order to confirm gender differences proposed in the present study. Second, and regarding elasticity measures, research has suggested that altruism (Arnocky et al., 2017) and social status (Pawlowski & Dunbar, 1999, 2001) may influence sexual activity; however, this was not found in the present study. It may be that neither high nor low altruism and social status were captured here, so this should be rectified utilizing different and more profound information regarding high and low altruism and social status. For social status, the low social status partner

mentioned a pet. According to informal research, this may have had the opposite effect. Six hundred dating app users were surveyed by Honest Paws (Todisco, 2021), and results suggested that 70% of users believe displaying or mentioning a pet helps achieve more matches on dating apps. Over 60% of respondents also reported being more likely to want to match with a user mentioning or displaying a pet, particularly for females viewing males. According to Todisco, the presence of a pet may then be a discriminative stimulus for high commitment and trustworthiness. It is possible that the present study accidentally captured a different attribute when attempting to capture low social status, at least for females. Future studies may seek to extrapolate the effect pets have on the behavior of choice, and sexual demand and elasticity.

Third, there were no differences in satisfaction or confidence across differing array sizes in choice overload procedures, contradictory to previous research (Chan, 2015; Chernev, 2003; Iyengar et al., 2004; Iyengar & Lepper, 2000; Karsina et al., 2011; Miller et al., 2017; Reed et al., 2011; Saltsman et al., 2019; Schwartz, 2004). As discussed previously, it may be that not enough time had passed from the selection of a preferred partner to the consumption of that partner to adequately and accurately report satisfaction or confidence (D'Angelo & Toma, 2017). Follow-up studies should replicate the procedures in the current study, but incorporate a lag time to allow participants to ruminate their choice of partner.

Physiological context may influence behavioral economic outcomes. Skrynka and Vincent (2019) investigated food deprivation, or hunger, on the delay discounting of individuals for food and other commodities. When participants were food deprived, their discounting of food became steeper, and there was a 25% spillover to nonfood commodities. These results suggest that physiological states may impact one's ability to discount any given commodity in a given time, and suggests a fruitful route for researchers in determining the spillover effect hunger may

have on the demand and elasticity for sexual activity, and the effect other physiological states of deprivation have on demand and elasticity measures.

Finally, investigations into the heritability of demand and elasticity should take place. Research suggests that impulsivity measured through delay discounting for certain commodities may be more trait like (Anokhin et al., 2011; Audrain-McGovern et al., 2009). If motivation for sex and sexual activity may be phylogenetic in nature (Buss, 1989, 2003; Buss & Schmitt, 1993; Trivers, 1972), then perhaps demand and elasticity measures may follow this same suit. Odum et al. (2020) reviewed literature and found that there is evidence for the state-like nature of behavioral economic processes and outcomes, but there is also evidence for the trait-like nature of behavioral economic processes and outcomes. If longitudinal studies or studies analyzing relatives could take place between males and females in the demand and elasticity for sexual activity, then evidence can be gathered to support this notion of the trait-like nature of demand and bring furthering evidence to the evolutionary perspective of psychology regarding sex (Buss, 1989, 2003; Buss & Schmitt, 1993; Trivers, 1972).

Conclusion

When taken as a whole, it is evident that males and females value sex differently, and that different attributes affect the value of sex. With this differing value in sex, which may be rooted in human genetics, risky sexual behavior may be a collateral behavior. Dating apps may contribute to and facilitate this risky sexual behavior, particularly for males, and as a result intervention should occur on dating apps that bring awareness to potential side effects such as contracting STIs (Centers for Disease Control and Prevention, 2020). The results of the present research should guide the behavior of those seeking the company of males and females, facilitating the potential in courting a desired sexual partner. Choice and choice overload

regarding dating apps still warrants further investigation. Despite individuals forfeiting their ability to make a choice as larger partner arrays are presented, follow-up studies should further investigate the effect of choice overload. In particular, procedures measuring satisfaction and confidence should be rectified to reflect the true online dating and real-life dating experience and consumption of partners. Males and females, and online daters and online abstainers view and value sex differently. Behavioral economics should continue to investigate these groups to further unpack these differences to confirm males as success objects and females as sex objects (Davis, 1990), and to confirm where dating apps stand in their influence of sex, choice, and risky sexual behavior.

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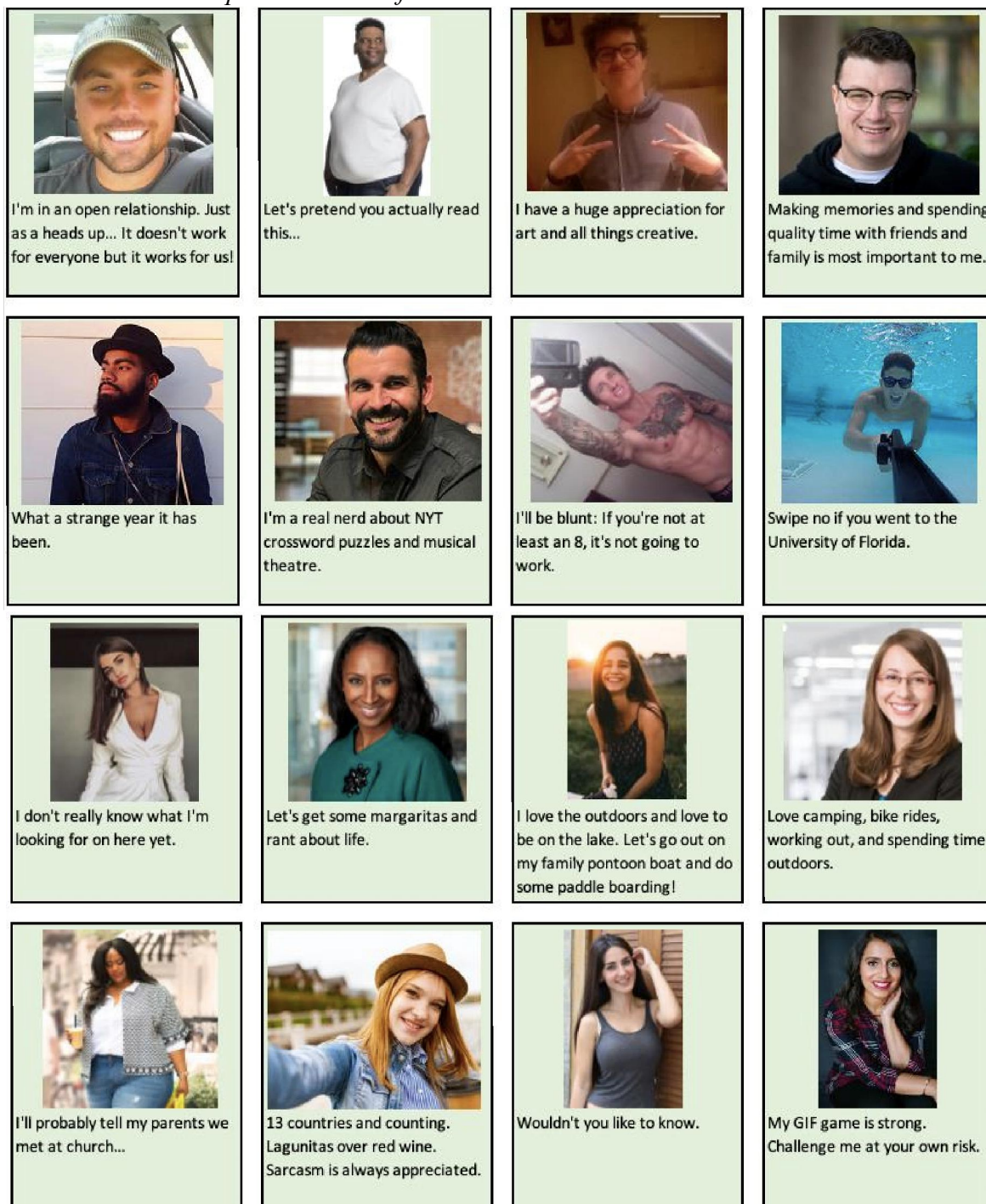
Figures

Figure 1

Elasticity Sex Partners



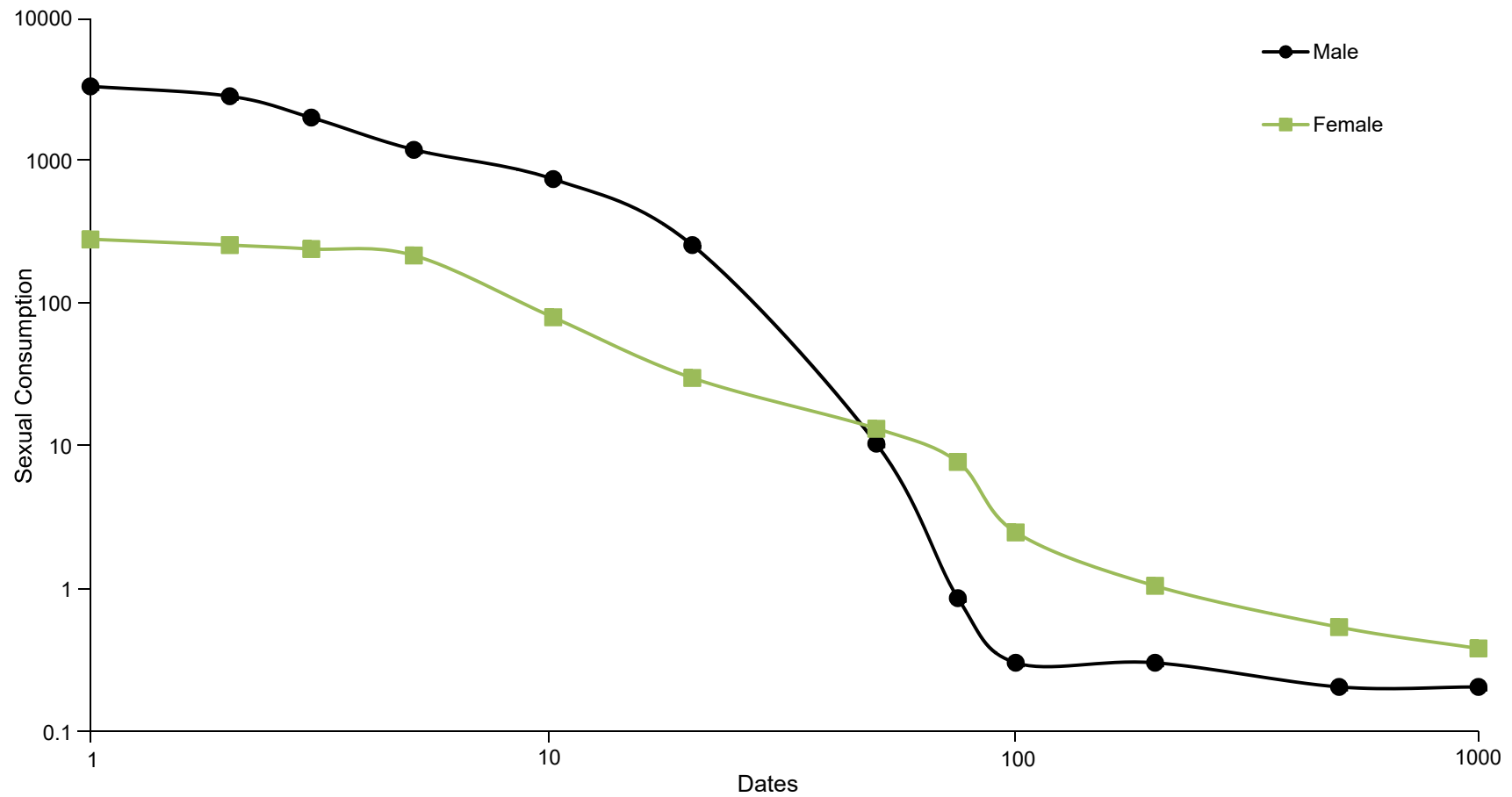
Note. Males left to right column: altruism, intelligence, social status, intelligence. High attributes are on the top, low attributes are on the bottom. Females left to right column: altruism, intelligence, financial prospect, social status. High attributes are on the top, low attributes are on the bottom.

Figure 2*Choice Overload Example Partner Profiles*

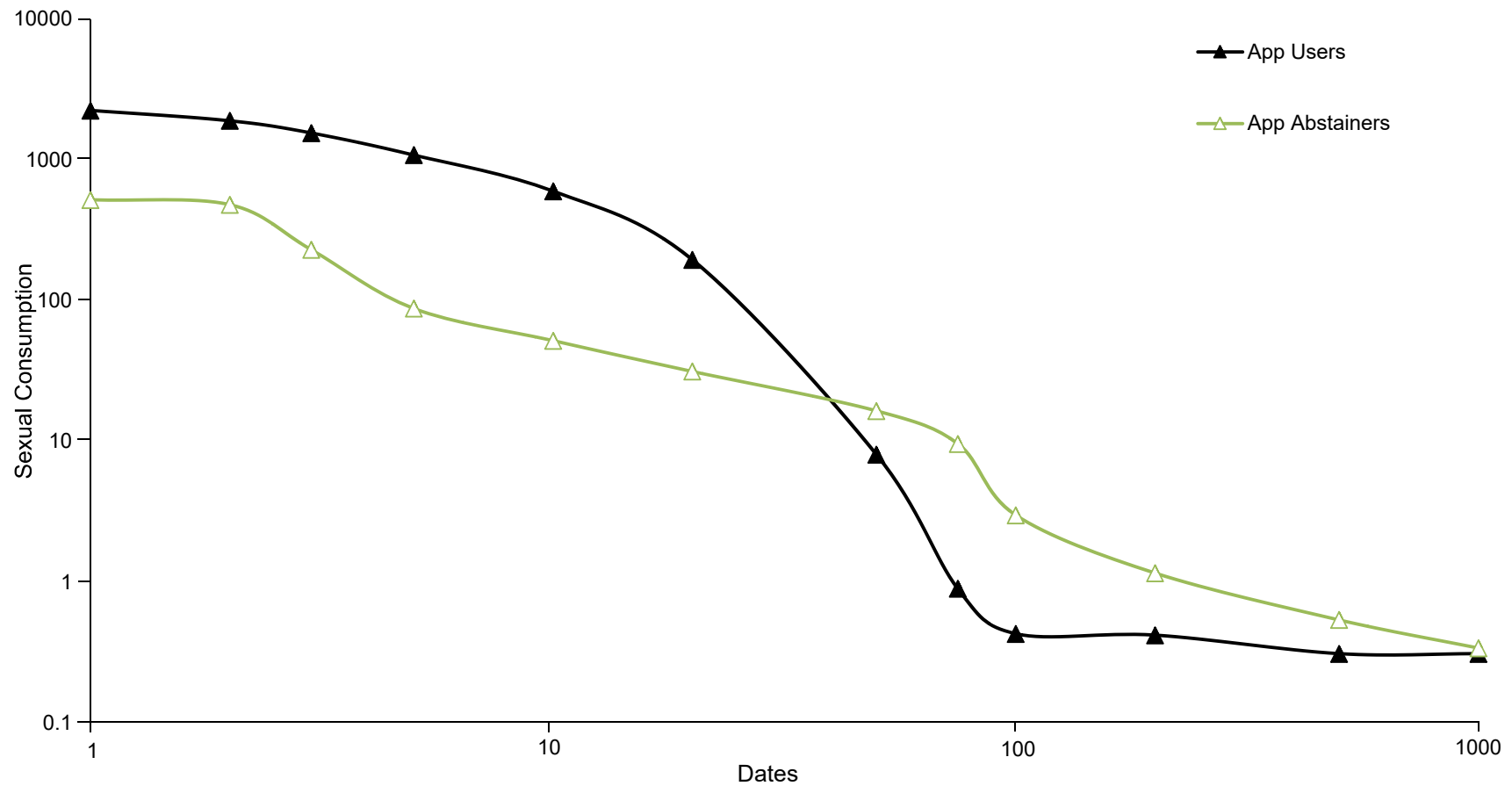
Note. All blurbs were the same for both males and females, and all gender identifiers were changed accordingly.

Figure 3

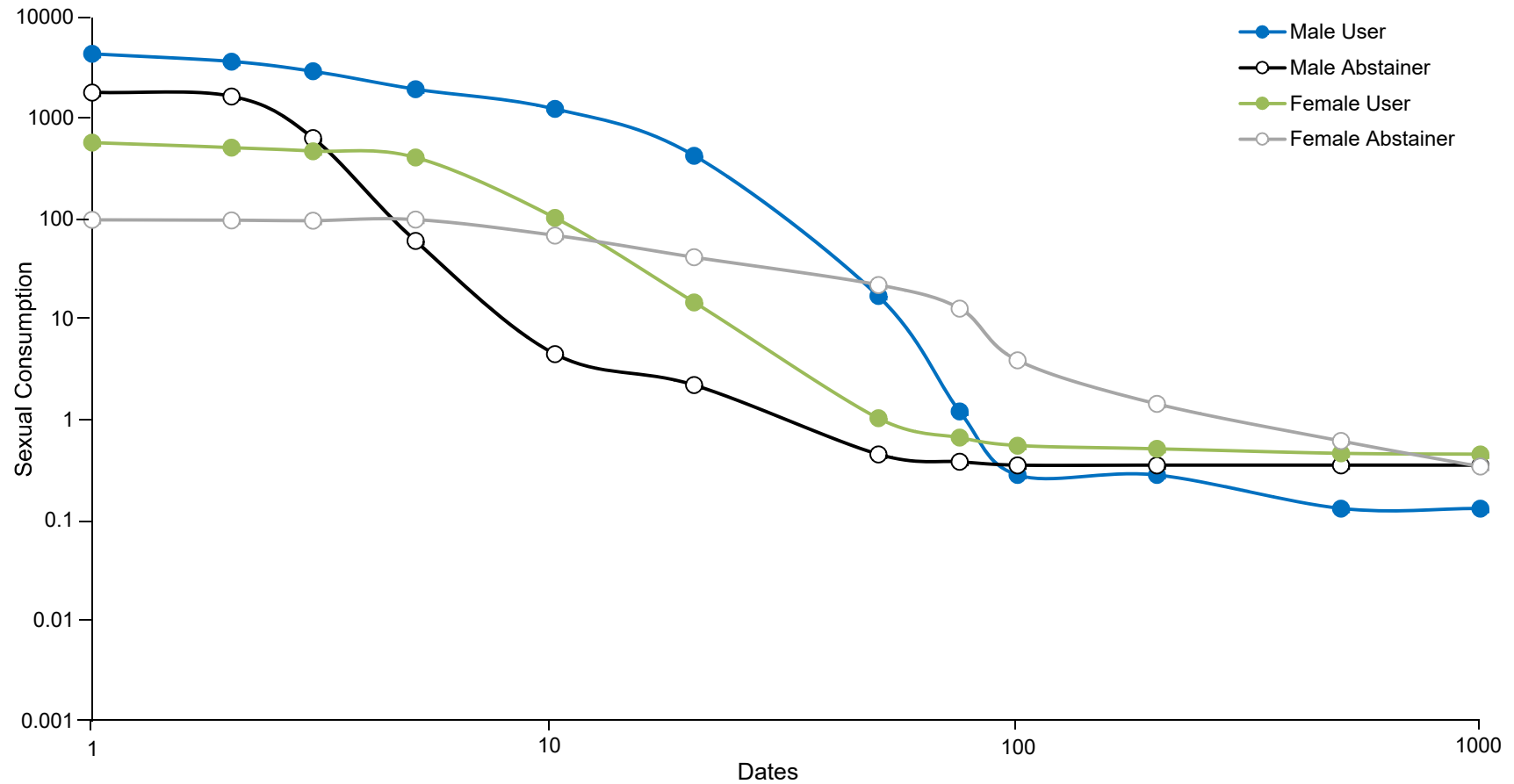
Demand and Elasticity for Sex Between Males and Females



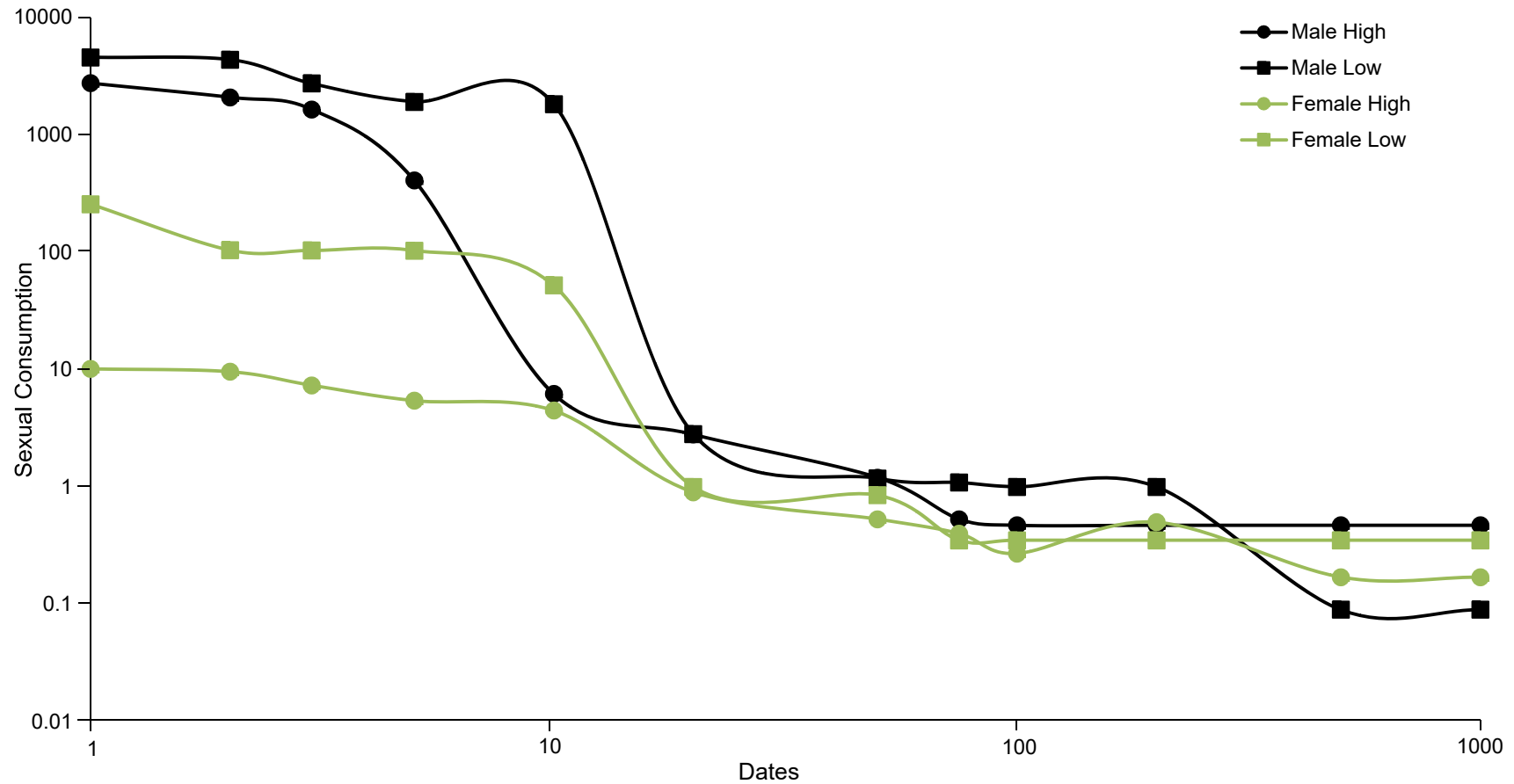
Note. Males showed significantly increased demand for sex up to 20 dates.

Figure 4*Dating App Users Versus App Abstainers*

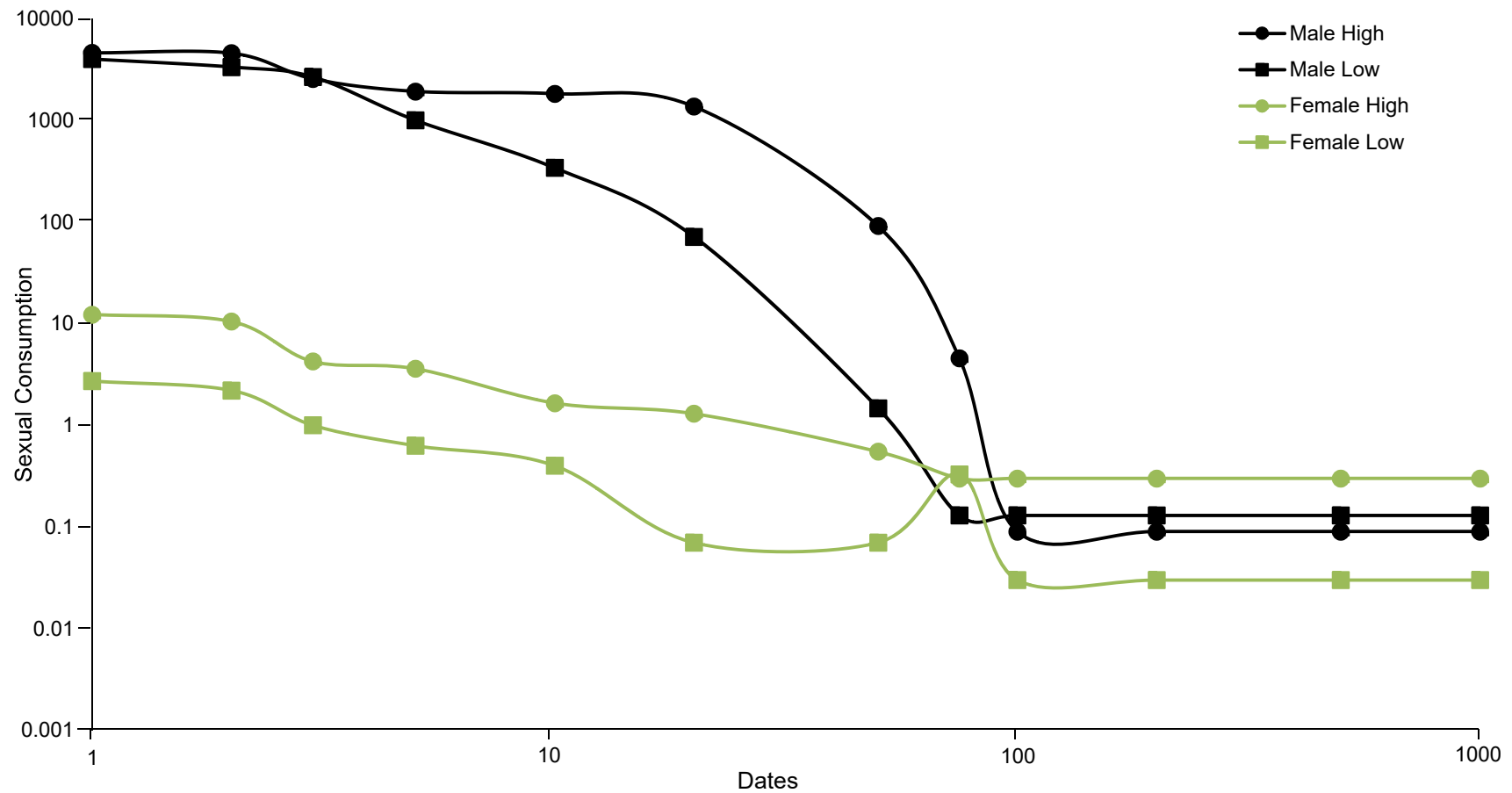
Note. Significant differences existed up to 10 dates where dating app users reported significantly more demand for sex.

Figure 5*Male Versus Female App Users Versus App Abstainers*

Note. Significant differences existed up to 20 dates where male dating app users reported more demand for sex.

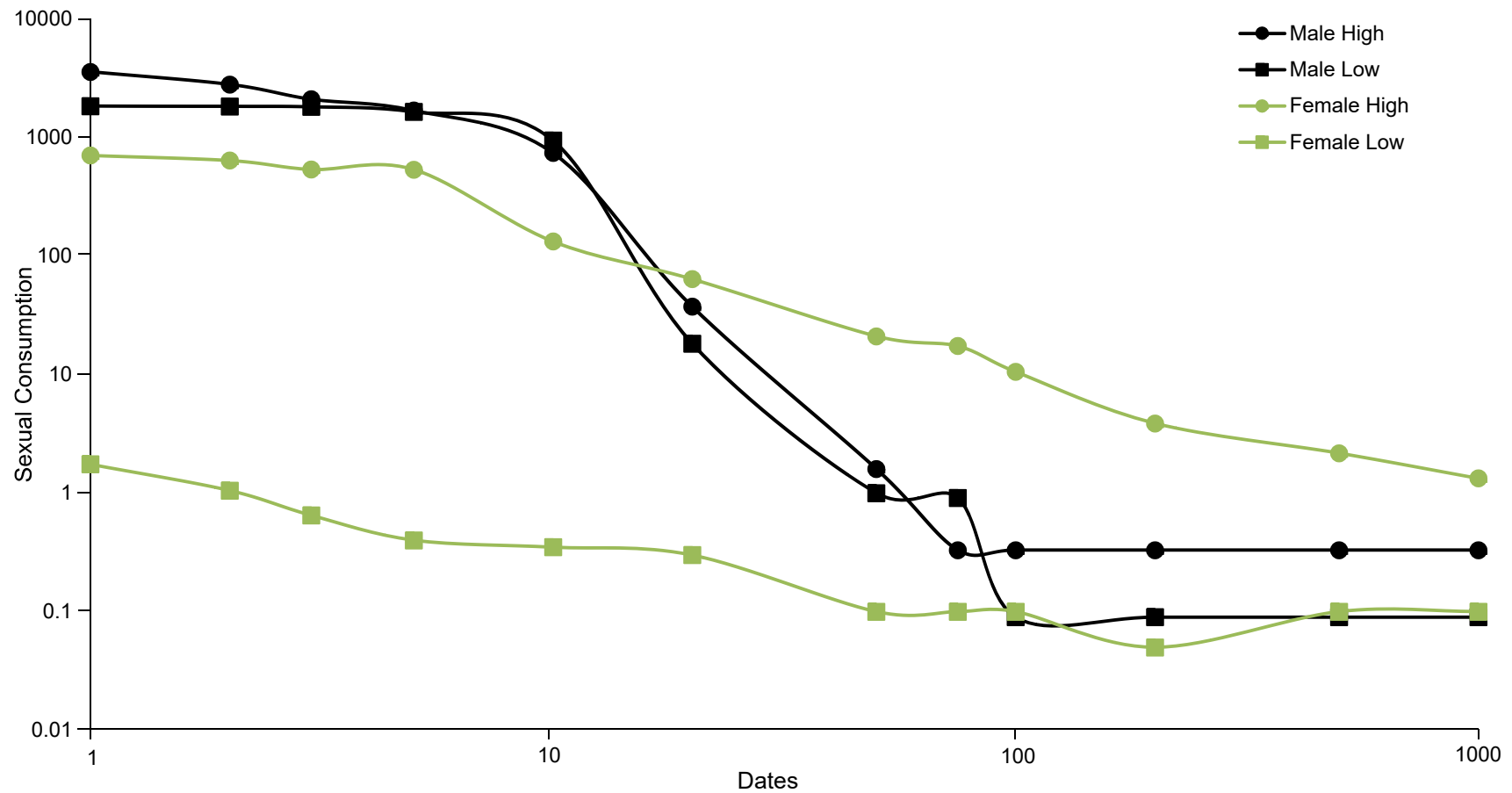
Figure 6*High Versus Low Altruism*

Note. The low altruism partner showed stronger demand for females suggesting “low altruism” may not have been truly captured.

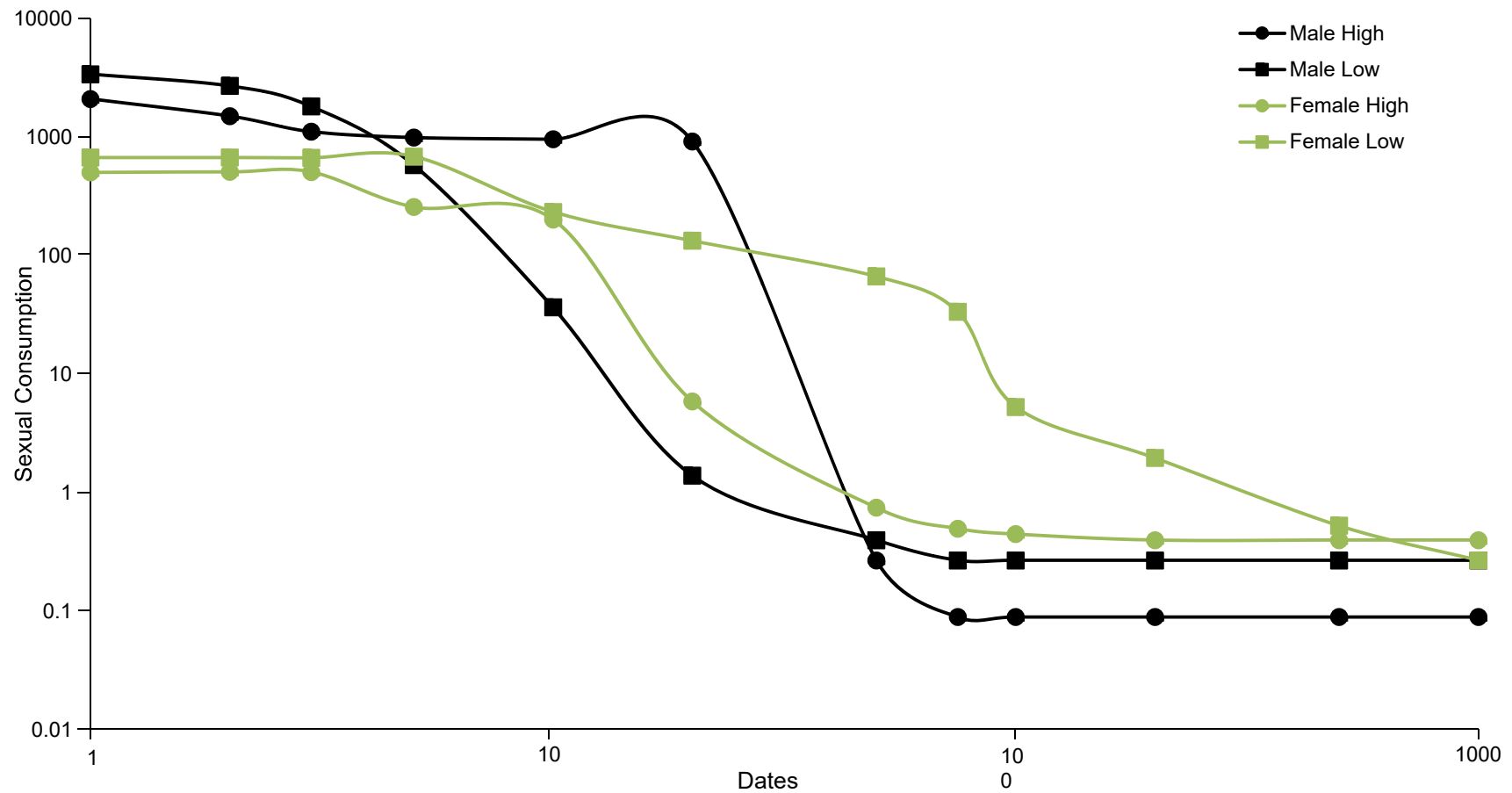
Figure 7*High Versus Low Financial Prospect*

Note. A lower overall demand of sex for females in general suggests a less physically attractive partner may have been displayed.

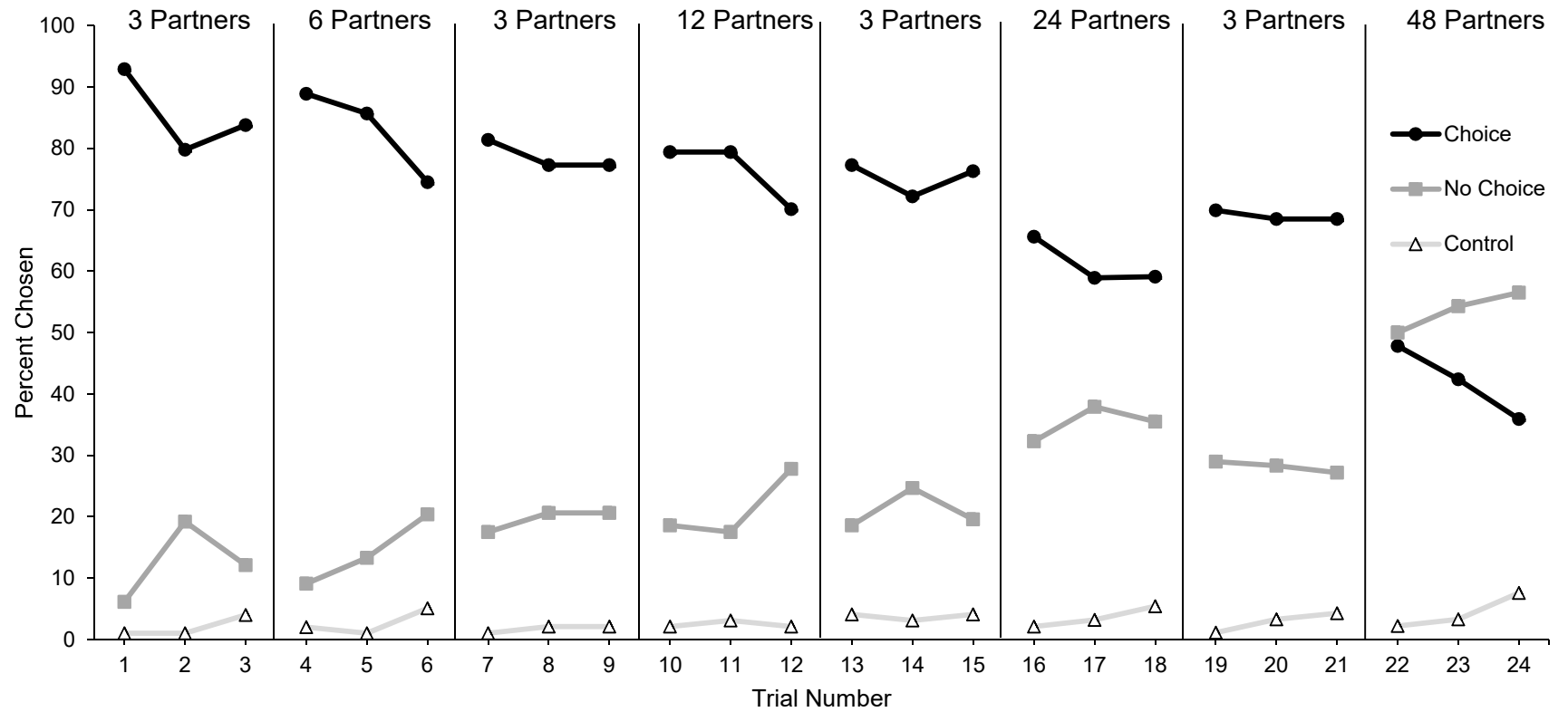
Elasticity differences between high and low partners for females was approaching significance ($t[48] = 1.927, p < .06$)

Figure 8*High Versus Low Intelligence*

Note. Intelligence showed the most profound differences for demand and elasticity, indicating intelligence may be the key attribute that makes a partner truly attractive beyond physical appearance, particularly for females' elasticity, $t(48) = 2.88, p < .027$.

Figure 9*High Versus Low Social Status*

Note. No differences existed around social status across group breakdowns.

Figure 10*Percent of Choice Between Choice, No Choice, and Control*

Note. An overall trend of decreasing choice across conditions is observed, which becomes more pronounced as array size increases.

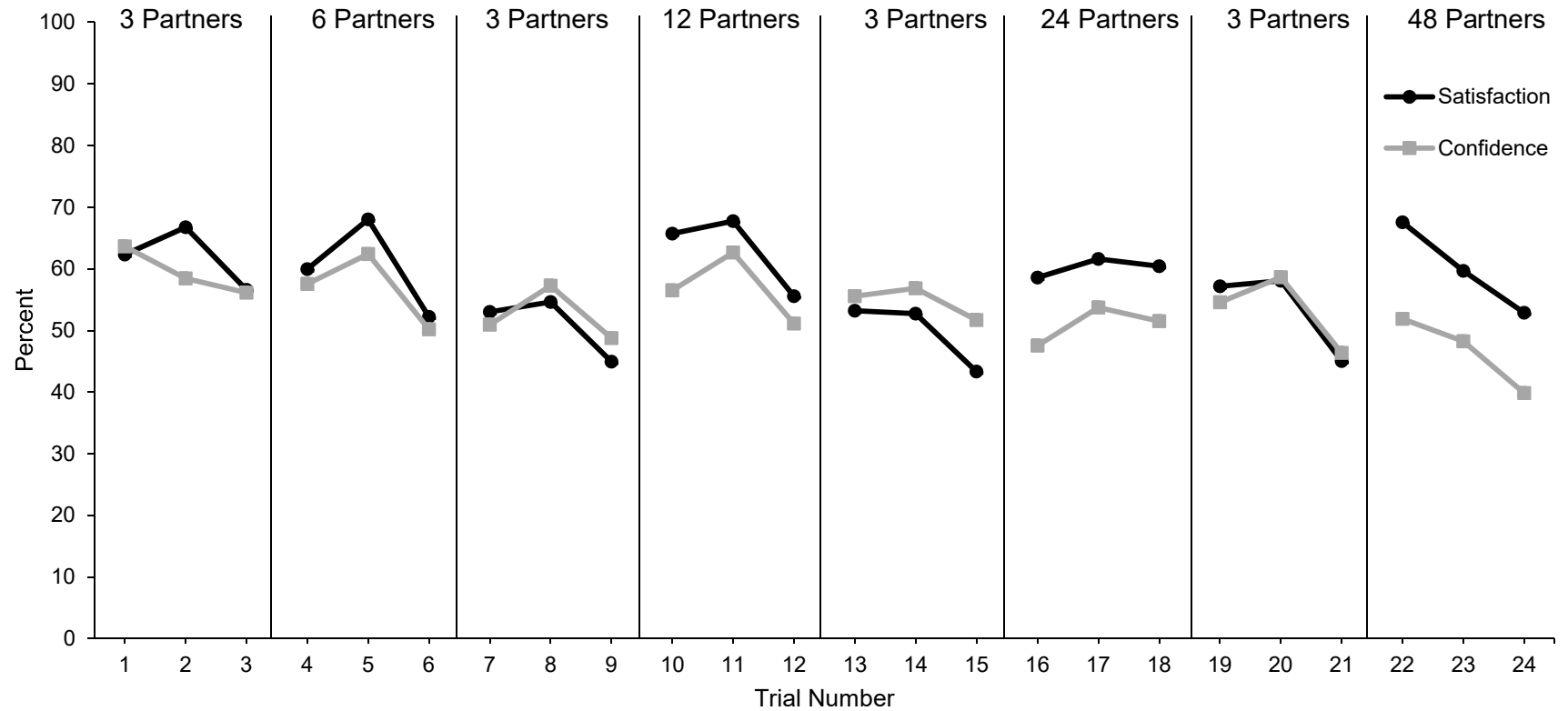
Figure 11*Satisfaction and Confidence in Sex Partner Overload**Note.* No differences were observed across satisfaction or confidence.

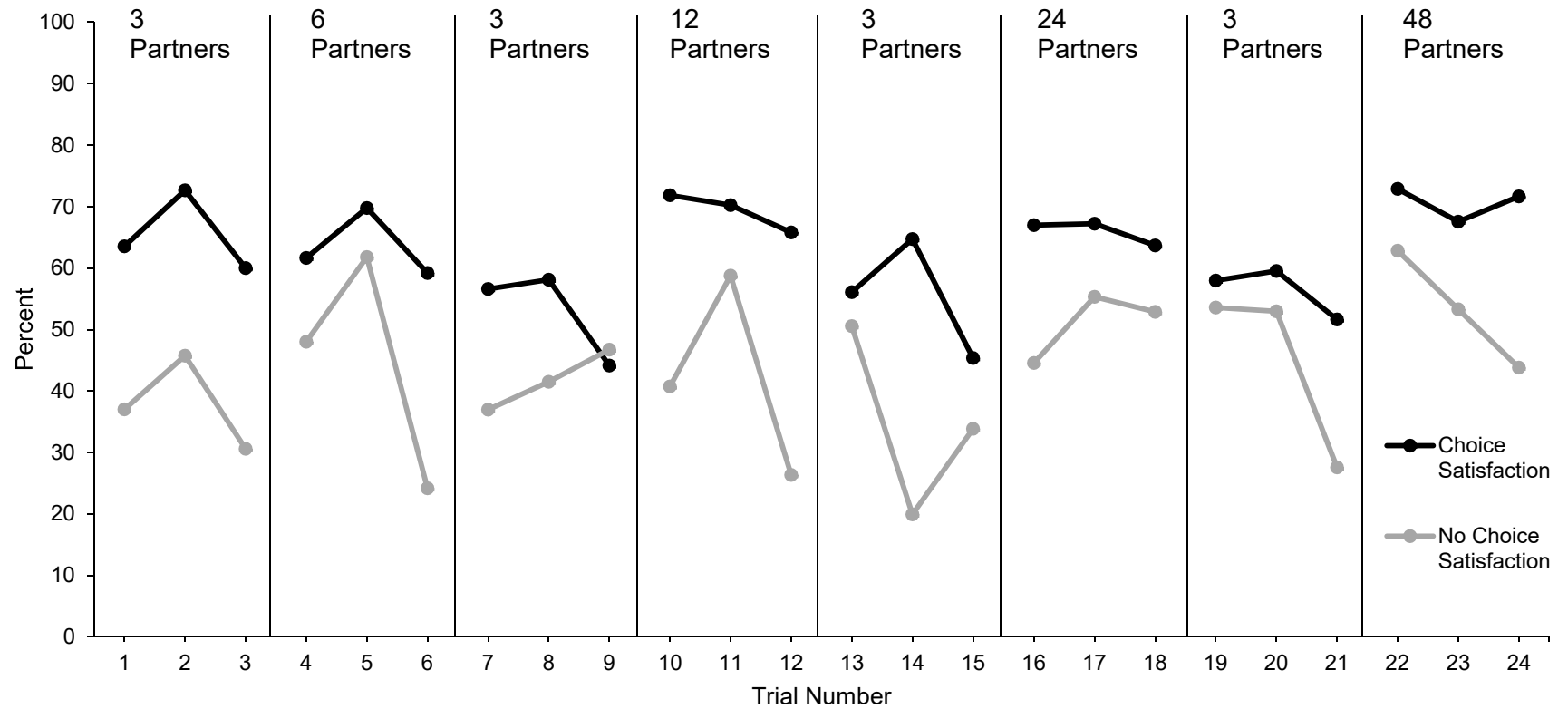
Figure 12*Satisfaction Between Choice and No Choice**Note.* Control was omitted due to low numbers of participant selections.

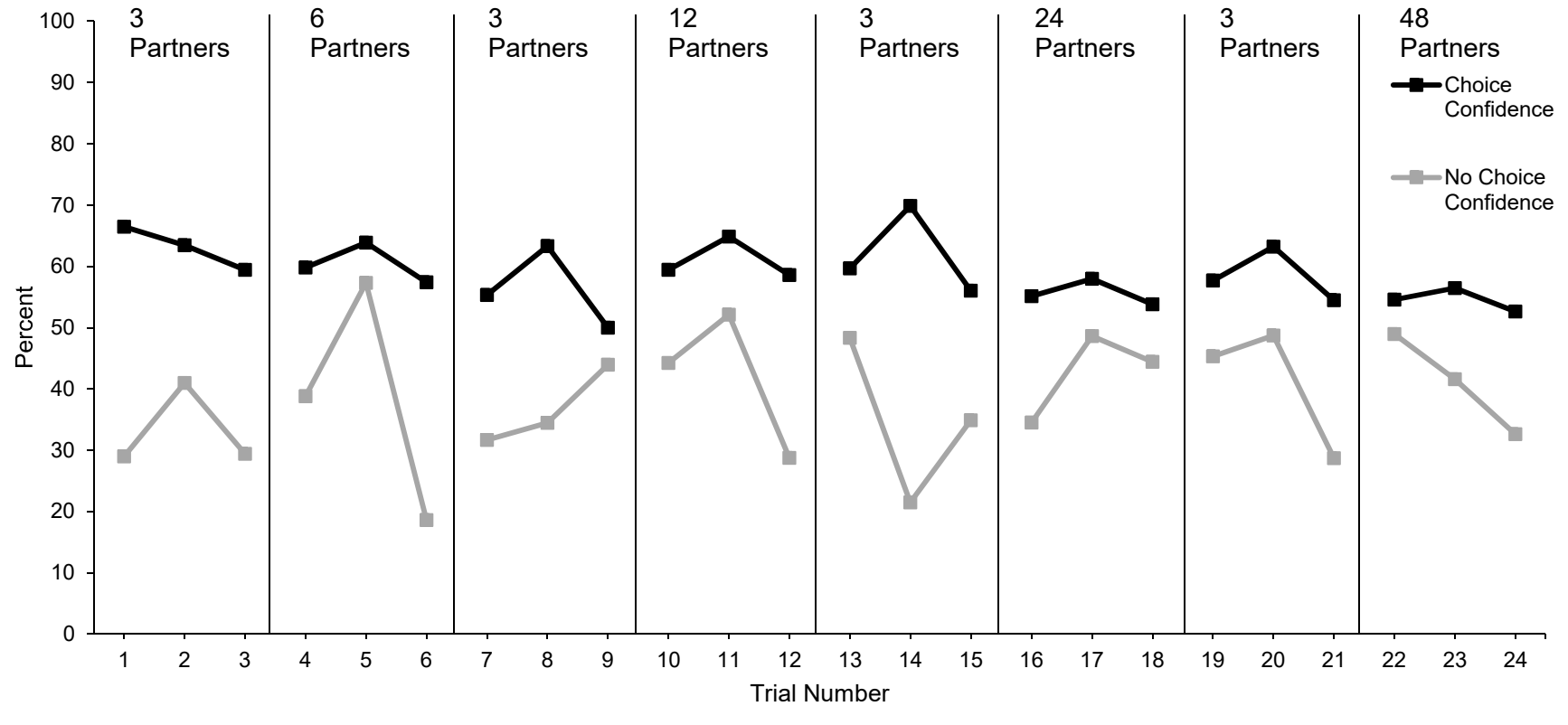
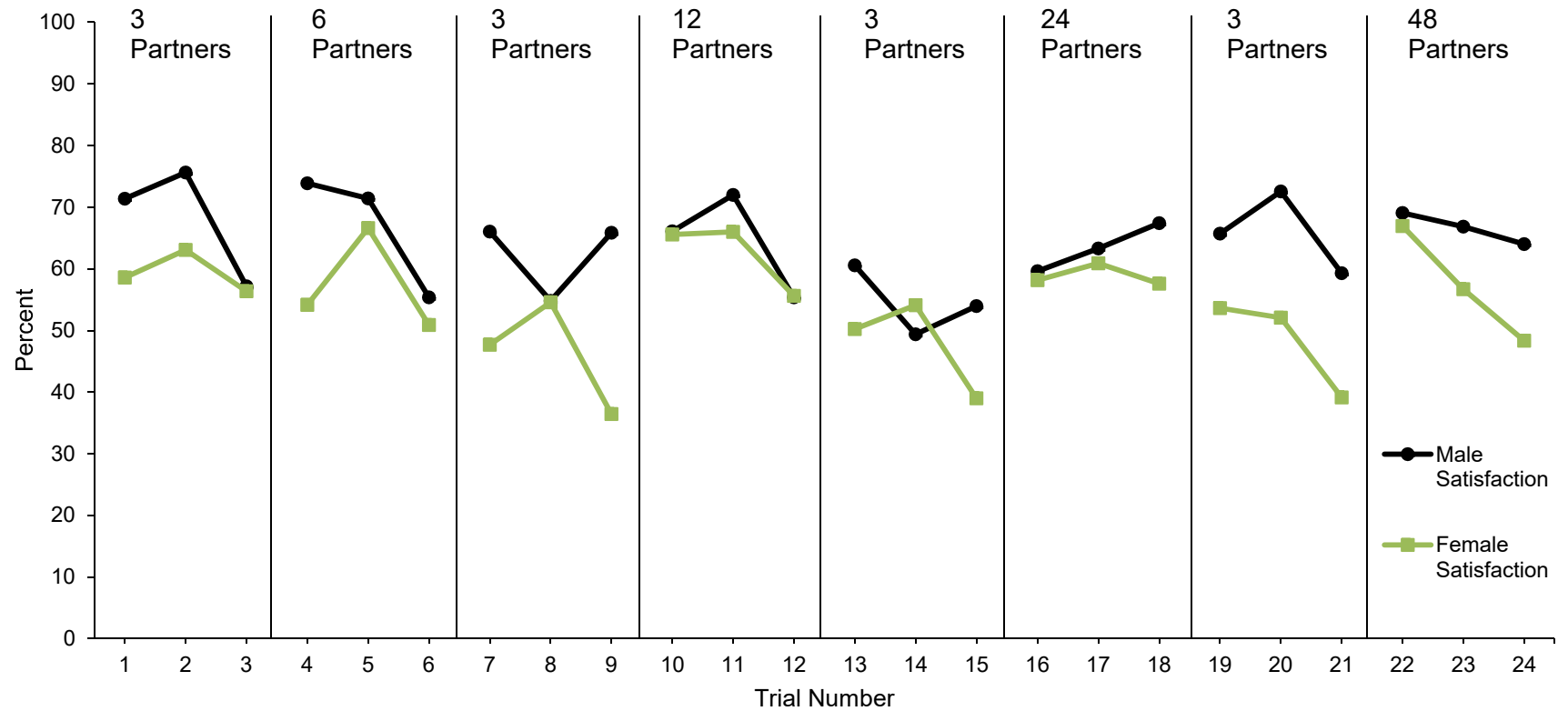
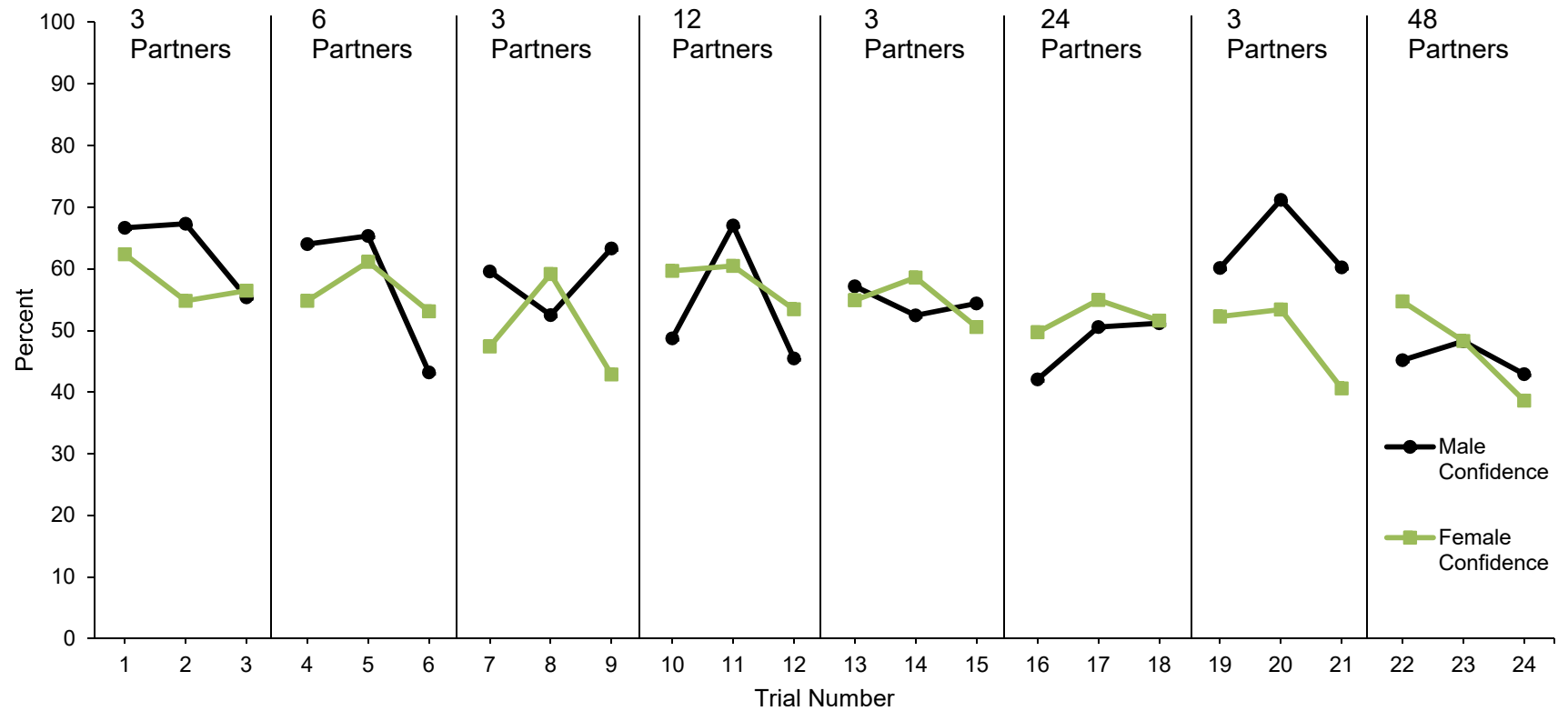
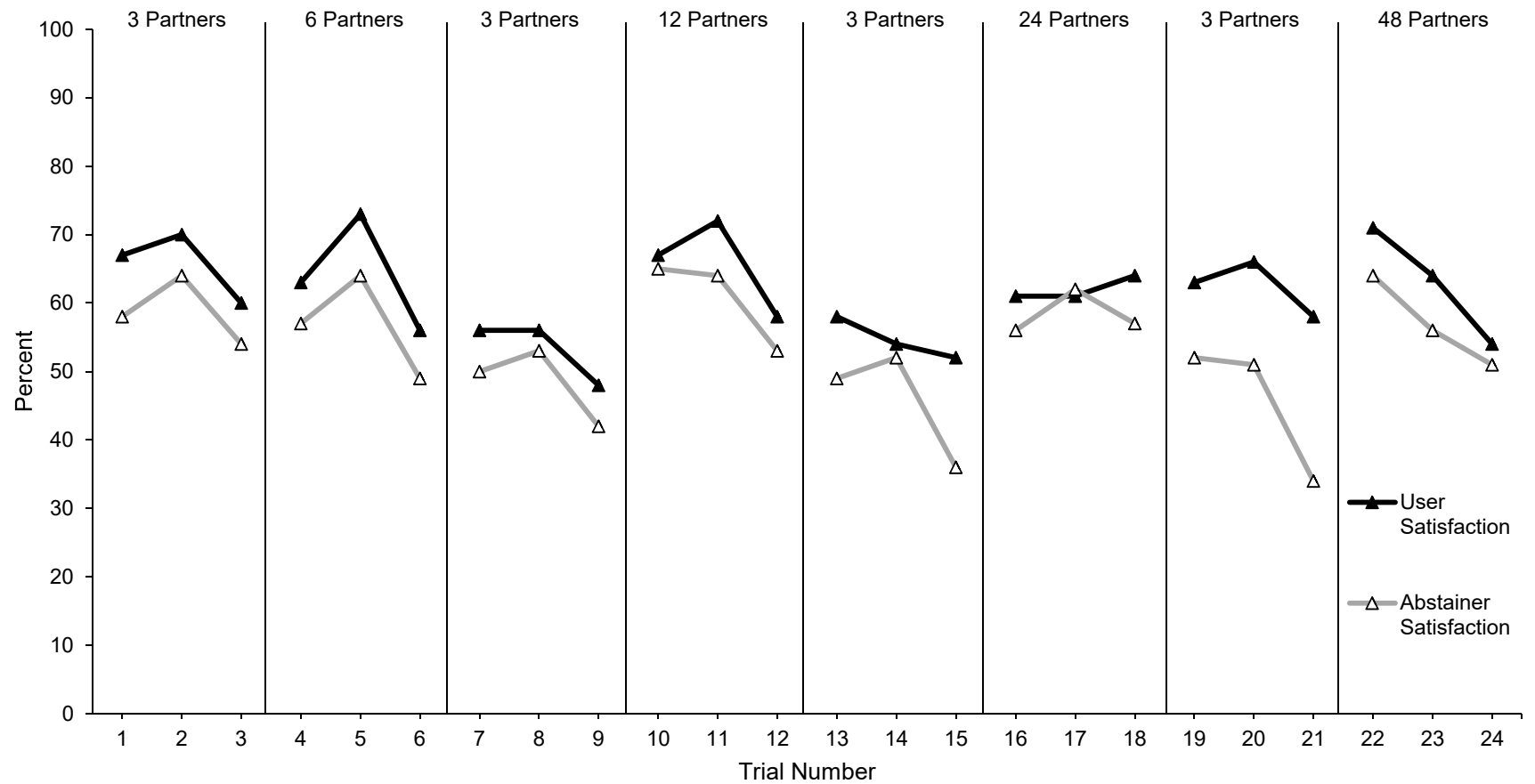
Figure 13*Confidence Differences Between Choice and No Choice**Note.* Control was omitted due to low numbers of participant selections.

Figure 14*Satisfaction Between Males and Females*

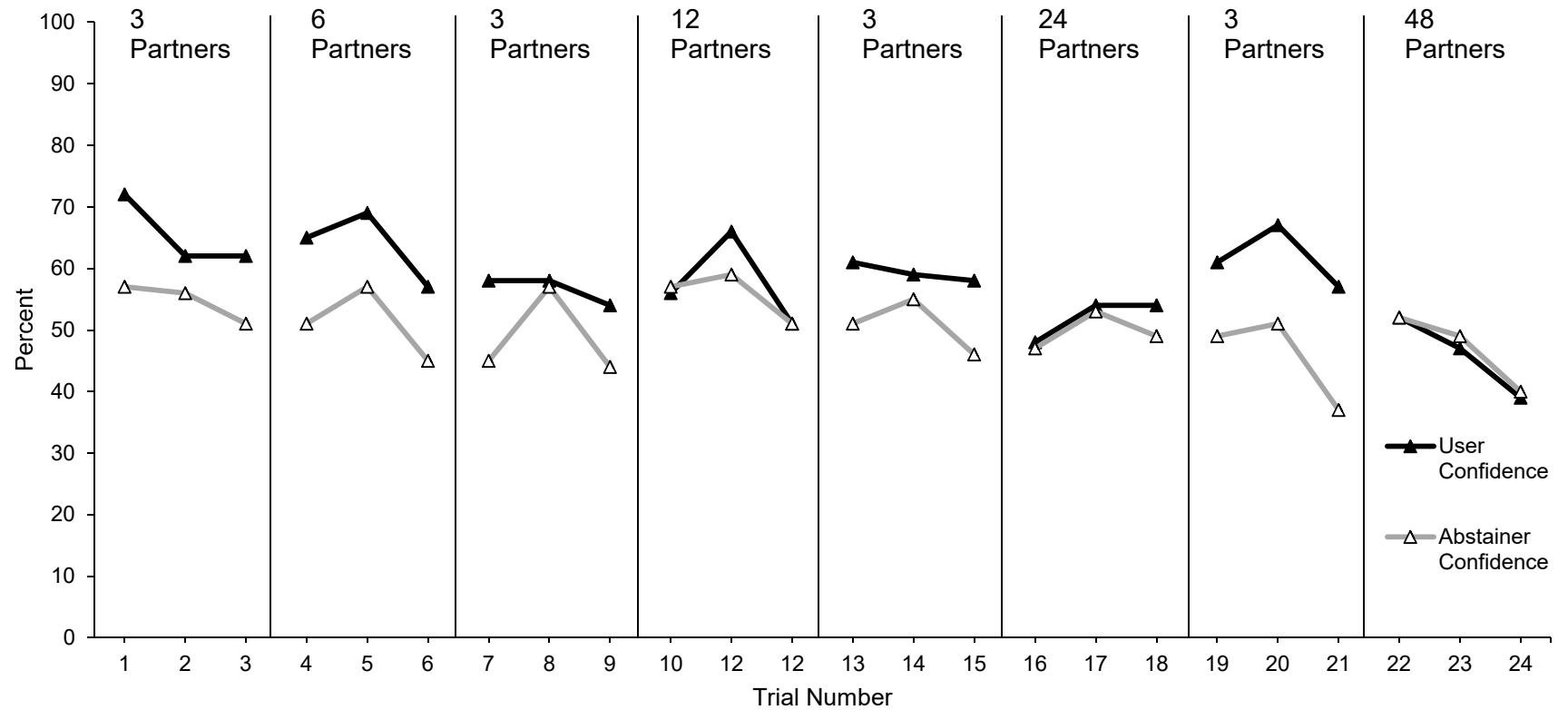
Note. Males tended to be more satisfied with their choices as 22 out of 24 trials saw males reporting higher satisfaction than females, eight of which were statistically significant.

Figure 15*Confidence Between Males and Females*

Note. Males were marginally more confident in their choices as 13 out of 24 trials saw males reporting higher confidence in their choices, only three of which were statistically significant.

Figure 16*Satisfaction Between Dating App Users and Abstainers*

Note. Dating app users tend to be more satisfied with choices than app abstainers as 23 out of 24 trials saw app users as more satisfied, three of which were statistically significant.

Figure 17*Confidence Between Dating App Users and Abstainers*

Note. Dating app users tended to be more confident in their choices than app abstainers as 19 out of 24 trials saw app users as more confident, seven of which were statistically significant.

Appendix A

Recruitment Form

Hello!

As part of my doctoral program, I am conducting research that will investigate dating app use (or not), choice, and sexual behavior, and I am hoping that you can be of assistance!

I am looking for both males and females who are single, over the age of 18, and sexually active (having had sex at least once) to complete a series of surveys on their use of dating apps, sensitivity to rejection, and recent sexual history, and then complete a hypothetical dating task and a partner selection task.

The study will take approximately 20 minutes to complete and requires nothing more than a computer or smartphone (however, a computer is recommended) and internet connection, and can be completed in the setting of your choice.

Thank you for your time and your consideration for participation in this research. Should you have any further questions regarding this research, please do not hesitate to contact me through the information at the end of this post. If you would like to participate, please click the link below to begin!

https://survey.az1.qualtrics.com/jfe/form/SV_e8KCOyOBhkFmMFD

Ryan Bable

Email: rbable@ego.thechicagoschool.edu

Phone: 3179978800

Appendix B

Screening Document

Hello and welcome to the study! Before we begin, please review the following statements:

1. I am single, meaning not declaring as engaged in a monogamous relationship
2. I am over the age of 18
3. I am sexually active, and have had sex with at least one person

By clicking “I Agree” and proceeding to the next page, you are attesting that all three criteria apply to you. If one or more of these criteria do not apply to you, please exit the survey.

☐ I Agree

Click next to continue, or click exit if one or more of the above criteria do not apply to you.

Appendix C

Informed Consent



Investigators: Ryan Bable, Dr. Julie Ackerlund-Brandt

Study Title: Choice and Demand, Sex and Success: How many is too many and what do males and females like?

I am a student at The Chicago School of Professional Psychology. This study is being conducted as a part of my independent study requirement for the Ph.D. in Applied Behavior Analysis.

I am asking you to participate in a research study about sexual behavior and dating. You will be asked to complete a series of online surveys regarding rejection sensitivity, dating app confidence, sexual history and motivations for sex, a hypothetical dating task, and to complete a choice task for sexual partners. This will take approximately 20 minutes to complete. This may cause discomfort due to the sexual nature of the questions and the language used, may cause boredom from the repetitive nature of the questions, and a potential loss of confidentiality may occur. Although you may not benefit, it will help to understand the difference in the value of sex between males and females, and help understand how too much choice affects our satisfaction with romantic/sexual partners.

Please take your time to read the entire document and feel free to ask any questions before signing this document.

Purpose: The primary purpose of this study is to evaluate whether males and females value sex differently from potential sexual partners who have different specific attributes accentuated (e.g., intelligence, or social status). This will be done by investigating how much effort a person is willing to make to engage in sexual activity with a hypothetical partner. The secondary purpose is to determine if a progressively increasing number of romantic partner options affects a person's willingness to choose a romantic partner, and if an increasing number of options affects their satisfaction and confidence with their choice.

Procedures: For this study you will be asked a series of questions through a series of online questionnaires. First you will be delivered a demographic survey asking age, gender, sexual orientation, nationality, religion, political leaning, income, and sexual history. You will also be asked if you use dating apps. If yes, you will complete three questions on your use. Next, you will complete an 8-scenario questionnaire that will investigate your sensitivity to rejection, then you will complete a Sexual Risk Survey. This is a questionnaire that asks about sexual history and motivations to engage in sexual activity.

You will complete a hypothetical sex and dating questionnaire about four different specified sexual partners. Before beginning, you will be asked to choose the gender of the partners you would like to see, and you should choose the gender you are sexually attracted to. For example, if you identify as a straight female you would choose to see males, if you identify as a homosexual male you would choose to see males, etc. If you identify as bisexual, you may choose either males or females. The specified partners

will be physically attractive and will have a few sentences of information attached that signals either high or low financial prospect, intelligence, altruism, or social status. You will see the picture of the partner and be asked, “How many times would you have sex with this person, beginning today, if each sex act required __ dates?” The date requirement will begin at 1 and progressively increase in value (i.e., from 1 date, to 1,000 dates). You will record your answer, and then the question will repeat with the new date requirement. This process will then repeat for the next partner.

Finally, you will complete a choice overload task. Once again, before beginning you will be able to choose the gender of the partners you would like to see, and you will again choose accordingly. You will first be told that you are about to see X number of sexual partners, and then asked if you would like to choose the best fit for you, if you would like the computer to choose the best fit for you, or if you don’t want to make any choice. If you make the choice to choose, you will be shown the specified number of partners and will be able to choose your preferred partner. If you make the computer choose, you will be shown a random partner, and if you opt not to choose at all you will be shown no partner. Afterward you will be asked to rate on a scale of 1 to 100 your satisfaction with the partner chosen and how confident you are that they were the best match for you. This will start at 3 partners, then 6, then 12, then 24, and finally 48, and will repeat 3 times for each number of partners. The entire electronic packet of surveys should take approximately 20 minutes to complete. Don’t worry if you’re a little confused, you will be walked through an example of this section when you get there to help understand.

Risks to Participants: Risks include 1) Discomfort during question answering as some questions in the study may ask personal information regarding sexual activity. 2) Discomfort due to language use during certain sections as some questions may be clarified using everyday slang and potentially offensive language that may be unfamiliar. 3) Boredom as the repetitive nature of the procedure may reduce attending to tasks and surrounding stimuli. 4) Loss of confidentiality. Steps to minimize risk include ensuring confidentiality by removing all personal identifiers and replacing them with a number when reporting data. Warnings are also included to remind of upcoming potentially offensive language. If you feel uncomfortable and wish to stop at any point, you may terminate participation by clicking the X on the page.

Benefits to Participants: Although you may not benefit, your participation will help to determine whether males and females evaluate potential sex partners differently, and help understand how too much choice affects our satisfaction with romantic/sexual partners. A potential benefit as participating in this study is that you may self-reflect on current sexual behavior and as a result engage in safer sex practices merely through the identification of sexual history. The overall benefit to the field of science is that a greater understanding of the effort level willing to be expended to access a potential mate between genders and dating application use will be gained.

Alternatives to Participation: Participation in this study is voluntary. You may withdraw from study participation at any time without any penalty.

Confidentiality: During this study, information will be collected about you for the purpose of this research. This includes age, gender, sexual orientation, nationality, ethnicity, political leaning, income, religion, sexual history, and sexual motivations.

All completed questionnaires will be kept in a locked file for 5 years. They will only be accessible to researcher and advisor. During the course of this study, only this writer and the advisor will have access to electronically stored files via secure password. Identifying information removed and unique participant identifiers created such that anonymous and confidential data will be utilized for all resulting presentations and publications. Questionnaires sent via the internet will not require any identifying information or record participants email or IP address.

It is possible that your data may be used for future research or distributed to another researcher without your consent. However, information that could identify you will be removed.

Your research records may be reviewed by federal agencies whose responsibility is to protect human subjects participating in research, including the Office of Human Research Protections (OHRP) and by representatives from The Chicago School of Professional Psychology Institutional Review Board, a committee that oversees research.

Questions/Concerns: If you have questions related to the procedures described in this document please contact Ryan Bable at rbable@ego.thechicagoschool.edu

Dr. Julie Ackerlund-Brandt at jbrandt@thechicagoschool.edu

If you have questions concerning your rights in this research study you may contact the Institutional Review Board (IRB), which is concerned with the protection of subjects in research project. You may reach the IRB office Monday-Friday by calling 312.467.2335 or writing: Institutional Review Board, The Chicago School of Professional Psychology, 325 N. Wells, Chicago, Illinois, 60654.

Consent to Participate in Research

If you do not consent, please close the window to exit the survey. If you consent and wish to proceed to the study, please check “I consent” and proceed.

☐ **I Consent**

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