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Delay Discounting, Dating Applications, and Risky Sexual Behavior: An Exploratory Study

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Abstract
Research on delay discounting and sex suggests that discounting measures correlate to risky sexual behavior. Dating applications are a growing trend in sexual partner seeking and dating culture, but the relationship between dating applications, delay discounting, and risky sexual behavior is relatively unknown. The present study sought to examine the relationship among reported dating application use, delay discounting, and risky sexual behavior. Participants completed a demographic questionnaire that included sexual history and dating-app status, a sexual risk survey, and a delay discounting task involving minutes of hypothetical sexual activity. Sexual discounting was significantly correlated with measures of sexual risk. The strength in correlation was higher for those using dating applications and nonexistent in those not using dating applications. No significant differences existed between dating application users and abstainers for sexual risk or sexual discounting. The implications regarding safe sex practices are discussed.

Keywords Delay discounting · Sexual discounting · Behavioral economics · Online dating · Risky sexual behavior

Reinforcement pathology attempts to understand suboptimal choice in domains of health (Bickel et al., 2017; Jarmolowicz et al., 2016) and suggests that there is dysregulation for some individuals in the decision system for reward valuation between delayed and immediate rewards (Jarmolowicz, Reed, & Bickel, 2014b). Poor health decisions are consistently related to the inability to select future rewards over immediate gratification (Jarmolowicz et al., 2015). One way of measuring this is *delay discounting*, which is the tendency to devalue rewards as a function of a delay in time before receiving them, resulting in a preference for a smaller, more immediate stimulus over a larger, more delayed stimulus (Hursh et al., 2013). For humans, delay discounting tasks typically involve making the choice between a small, relatively immediate outcome, and a large, delayed outcome (Rachlin et al., 1991). This phenomenon

of delay discounting, or myopic intertemporal decision making, across different commodities and discounting task types may be used to characterize an individual's *impulsiveness* (Ainslie, 1975; Green & Myerson, 2013).

An area gaining particular attention in delay discounting is sex (e.g., Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2015; Jarmolowicz, Landes, et al., 2014a; Johnson & Bruner, 2013; Lawyer et al., 2010; Lawyer & Schoepflin, 2013; Lemley et al., 2017; Sweeney et al., 2019). Steeper rates of sexual discounting have been correlated with an increase in sexually risky behavior (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2015; Lemley et al., 2017; Sweeney et al., 2019). This relationship is significant, because it suggests that individuals who report sexual impulsivity may display risky sexual and promiscuous behavior that may compromise sexual health and potentially the health in general of that individual (Collado et al., 2017; Dariotis & Johnson, 2015; Sweeney et al., 2019), so determining variables that may moderate this relationship is critical.

One understudied variable that may impact the relationship risky sexual behavior has with the delay discounting of sexual behavior is the use of mobile dating applications (herein referred to as dating apps). As of 2019, 43% of single adults reported using dating apps multiple times a week

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(Kunst, 2019), making them a prevalent mode of partner seeking in our current dating culture. Sawyer et al. (2018) surveyed over 500 college students on their dating app use, sexual behavior, and motivations; almost 40% reported using dating apps, which correlated with higher rates of risky sexual behavior in 3 months leading up to the study (e.g., sex while on drugs, more sexual partners, and unsafe sex) than those not reporting use, even after controlling for demographic variables. Almost 25% of dating app users report using dating apps to find casual sex partners (Hobbs et al., 2017), and dating app users, in particular men, are also more likely to engage in risky sexual behaviors related to meeting partners face-to-face after using dating apps (Alexopoulos et al., 2020; Blackhart et al., 2014). Dating app use is also significantly correlated with more lifetime sexual partners (Sawyer et al., 2018).

These relationships between dating apps and risky sexual behavior, and risky sexual behavior and delay discounting of sex suggest that all three may be linked, or that dating app use may be a variable that moderates the relationship between risky sexual behavior and the delay discounting of sex. If the engagement with dating apps does moderate the relationship between sexual discounting and risky sexual behavior, then research may focus on dating apps to determine why this may be, such as motivation for using dating apps (Chan, 2017; Gatter & Hodkinson, 2016; Tanner & Huggins, 2018) or the high number of potential partner options available (D'Angelo & Toma, 2017; Spar, 2020). The present study was exploratory in nature, and sought to examine the relationship dating app use has to risky sexual behavior and the delay discounting of sex. The research questions were twofold: (1) Is temporal discounting of hypothetical sexual activity associated with sexually risky behavior, and is this relationship affected by dating app use? (2) Are there differences in the delay discounting of sexual activity and/or sexually risky behavior between dating app users and dating app abstainers? The first hypothesis, H_1, was that the relationship between hypothetical sexual discounting and sexual risk will differ between dating app users and abstainers. The second hypothesis, H_2, was that dating app users will report more sexually risky behavior and steeper discounting of hypothetical sexual activity.

Methods

Participants

A total of 132 single, heterosexual, and sexually active adults between 21 and 45 participated in the study. Participants self-identified as dating app users ($N = 58$), which was defined as currently logging on and interacting with others on dating apps at least once a day for at least 1 week.

Recruitment took place via research exchange groups on Facebook® and Reddit, and a university-based internal-recruitment email list. The age range was established based on research that suggests the majority of online daters are between the ages of 24 and 31 (Anzani et al., 2018), 40% of undergraduate (typically aged 18–22) report using dating apps (Sawyer et al., 2018), and the most common age range for internet daters is between 30 and 50 years of age (Valkenburg & Peter, 2007). Because the sexual risk survey (Turchik & Garske, 2009) probes alcohol use, 21 was set as the minimum age. Homosexual individuals were excluded from analysis ($N = 3$) because too few participated to create meaningful comparisons. Participants were also excluded for identifying as being in a monogamous relationship ($N = 2$) and for inconsistent responding during the discounting task (rapid alternation between the smaller sooner and larger later at a single delay), compromising the ability to calculate coherent indifference points at different delays for AUC measures ($N = 20$), leaving a total of 107 participants (86 women) for analysis.

Data Analysis

All data collection occurred anonymously online via Google Forms®, and in the participants' desired location using either a smartphone or computer. Sexual discounting, the primary dependent variable, was represented by the area under the curve (AUC; Myerson et al., 2001), and calculated using a Microsoft Excel® AUC calculator (Reed et al., 2012). Sexual risk (described below) and lifetime sexual partners were secondary dependent variables.

Procedure

Demographics Questionnaire

After attesting to the inclusion criteria and obtaining consent, participants completed a demographics questionnaire that included basic questions such as age, self-identified gender, and education. Along with this, a questionnaire investigating current and previous history using dating apps was also completed. This included current online dating status, previous history with online dating, months spent on online dating apps, and the number of both online sex and nonsex partners. Other questions included were time since last monogamous relationship, weeks since last sexual encounter, and number of lifetime sexual partners.

Sexual Risk Survey (SRS)

The SRS (Turchik & Garske, 2009) surveyed the participants sexual history and motivations for sex within the previous 6 months across five sexual risk categories: risky sex

with uncommitted partners, risky sex acts, impulsive sexual behavior, intent to engage in risky sexual behavior, and risky anal sex. Questions in each category were ordinally coded and summed to create a category score, and all five categories were summed to create a total SRS score. The SRS has substantial internal test consistency and test–retest reliability (Turchik & Garske, 2009), and has been correlated with sexual impulsivity per AUC measures (Jarmolowicz et al., 2015; Lemley et al., 2017).

Hypothetical Sex Discounting Task

The discounting task asked participants to visualize their ideal romantic partner (Jarmolowicz, Landes, et al., 2014a). With their ideal partner in mind, participants selected between 30 min of hypothetical sexual activity after a prescribed delay (1 day, 2 days, 1 week, 1 month, and 6 months) or a smaller amount of hypothetical sexual activity immediately. The smaller amount systematically decreased at each delay as questions progressed, beginning at 27 min and ending at 1 min, whereas the larger amount of sex consistently remained at 30 min. Delays were presented sequentially, beginning with 1 day, and ascending to 6 months, and each delay required all discounting questions to be completed prior to moving to the next delay. The indifference point for each delay was then established as the point at which responding switched from the smaller sooner amount of sexual activity to the larger later amount of sexual activity. If only the smaller amount of sex was always chosen for any delay the indifference point was set to 1, and if larger amount of sex was always chosen for any delay the indifference point was set to 30.
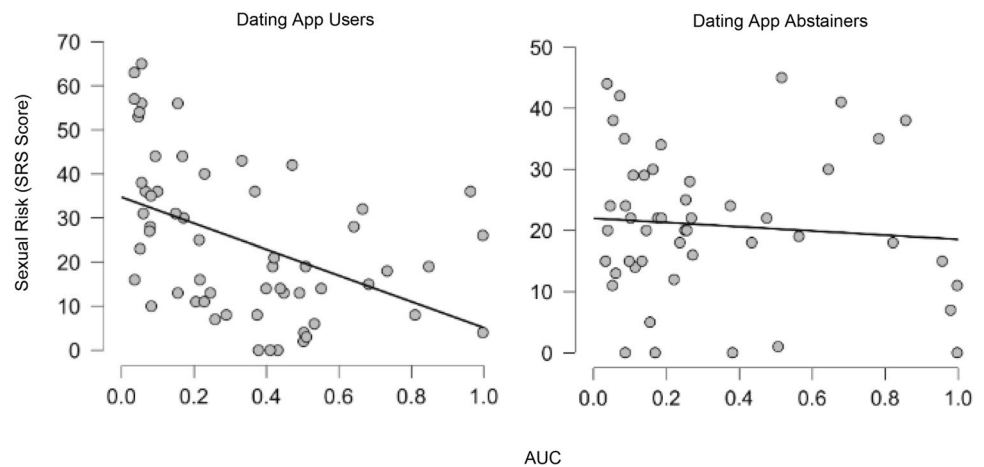
Results

In the sample, 52.7% of participants identified as current dating app users (N men = 10, N women = 48). Significant correlations utilizing Kendall's Tau-b are displayed in Table 1. Due to a high number of comparisons (N = 45) being conducted, Bonferroni correction was used, leaving α set at a conservative .001 for significance testing. AUC was significantly correlated to SRS scores (r_τ = -0.24, p = 0.001). Displayed in Fig. 1, a significant correlation existed between AUC and sexual risk for dating app users, but not abstainers. Fisher's z-transformation (Eid et al., 2011; Lenhard & Lenhard, 2014) suggested a moderately significant difference (Z' = 1.619, p = 0.053) in the correlations for AUC and sexual risk between app users and app abstainers. Sexual risk was significantly correlated to lifetime sexual partners (r_τ = 0.347, p = 0.001). Independent samples t-tests revealed no significant difference for AUC between dating app users and abstainers (t[105] = 0.367, p = 0.715, d =

Table 1 Kendall's Tau-b correlations between AUC and sexual risk

Category	Total Sample		Males		Females		Online Daters		Online Abstainers	
	Kendall's Tau-b	p	Kendall's Tau-b	p	Kendall's Tau-b	p	Kendall's Tau-b	p	Kendall's Tau-b	p
Risky Sex with Uncommitted Partners	-0.21	0.002	-0.227	0.155	-0.211	0.005	-0.347*	0.001	-0.065	0.517
Risky Sex Acts	-0.2	0.003	-0.322	0.045	-0.166	0.029	-0.323*	0.001	-0.027	0.789
Impulsive Sex Behavior	-0.138	0.044	-0.284	0.088	-0.106	0.166	-0.284	0.002	0.034	0.741
Intent to Engage in Risky Sex Behavior	-0.219	0.003	-0.285	0.092	-0.211	0.01	-0.37*	0.001	-0.069	0.534
Risky Anal Sex	-0.26*	0.001	-0.417	0.016	-0.227	0.006	-0.34*	0.001	-0.182	0.094
Total SRS Score	-0.24*	0.001	-0.363	0.023	-0.216	0.004	-0.357*	0.001	-0.05	0.616
Total Sexual Partners	-0.123	0.066	-0.402	0.013	-0.069	0.358	-0.188	0.04	-0.087	0.387

Depicts Kendall's Tau-b correlations for AUC and sexual risk behaviors for the total sample (N = 107), male sample (N = 21), female sample (N = 86), online dating sample (N = 58), and online abstainer sample (N = 49). Significant negative correlations exist for dating app users that do not exist for dating app abstainers, nor males and females. *p < 0.001

Fig. 1 Scatterplot between Dating App Users and Abstainers for Sexual Risk and AUC. *Note.* A significant correlation existed between sexual discounting (AUC) and risky sexual behavior for dating app users ($r_\tau = -0.357$, $p = 0.001$, $N = 58$), but this correlation was not observed for dating app abstainers ($r_\tau = -0.05$, $p = 0.616$, $N = 49$)

-0.071, 95% CI [0.088, 0.128]). Independent samples *t*-tests showed no significant difference for sexual risk between dating app users and abstainers ($t[105] = 1.308$, $p = 0.194$, $d = -0.254$, 95% CI [1.986, 9.679]). Regarding lifetime sexual partners, independent samples *t*-tests showed no significant difference between dating app users and abstainers ($t[105] = 1.351$, $p = 0.18$, $d = -0.262$, 95% CI [2.079, 10.973]).

Discussion

Consistent with previous literature (Collado et al., 2017; Dariotis & Johnson, 2015; Jarmolowicz et al., 2015; Lemley et al., 2017), risky sexual behavior and delay discounting of sex were negatively correlated ($r_\tau = -0.24$), because smaller AUC scores (steeper discounting) were correlated with increased sexual risk. This supports the notion that temporal sexual discounting may be related to risky sexual behavior (Jarmolowicz et al., 2015; Lemley et al., 2017) and reinforcement pathology (Bickel et al., 2017; Jarmolowicz et al., 2016; Jarmolowicz, Reed, & Bickel, 2014b). Though H_2 was not supported as neither AUC or sexual risk differences existed between app users and abstainers, the correlation between risky sexual behavior and sexual discounting was stronger in dating app users ($r_\tau = -0.357$) and nonexistent for dating app abstainers ($r_\tau = -0.05$), supporting H_1. The stronger relationship indicates that when it comes to risky sexual behavior, hypothetical sexual discounting has predictive utility for dating app users but not abstainers, perhaps because dating app users are more actively seeking new partners and thus create more opportunities for sexual risk taking when matching and meeting with a potential partner (Alexopoulos et al., 2020; Blackhart et al., 2014). Dating apps may also boast a plethora of potential partners to choose from, and a large array of options may lead to poor cognitive-behavioral performance outcomes such as diminished executive functioning, decreased stamina, and reduced self-control behavior (Saltsman et al., 2019; Vohs et al., 2008), increasing the likelihood of risky sexual behavior with those partners from this choice overload (D'Angelo & Toma, 2017; Schwartz, 2004).

Understanding the relationship delay discounting of sex has to risky sexual behavior and how dating apps may affect this relationship is important, because it may aid in understanding the spreading of sexually transmitted infections (STIs). Since 2014 there has been an increase in diagnoses of chlamydia by 19%, gonorrhea by 63%, and syphilis by 71% (Centers for Disease Control & Prevention, 2020), so determining critical variables that may contribute to this increase, and more predictably at-risk populations, may be beneficial to identifying areas for intervention in promoting sexual health. For some dating app users, it may be helpful to intervene using antecedent-based education on STI prevention/symptoms or safe-sex practices within dating apps.

There are limitations in the current study that should be addressed in future research. First, results may have differed had an image of the ideal mate been available because distraction or thoughts of anyone else may have influenced discounting outcomes; therefore, future researchers might include pictures of hypothetical mates. Second, a low number of males compromised and deterred any potential findings by gender. Research suggests that men may discount sex at steeper rates than women (Collado et al., 2017; Jarmolowicz, Landes, et al., 2014a; Johnson & Bruner, 2013; Lawyer & Schoepflin, 2013) and men may have more sexual motivations than women behind using dating apps (Gatter & Hodkinson, 2016; Tanner & Huggins, 2018). This may culminate in gender-based differences in sexually risky behavior, and certainly warrants investigation from future research, which should seek to replicate with a balanced number of men and women to explore potential gender differences within dating app users and abstainers. Future studies may seek to modify the discounting framework to determine if different

choices affect the degree of discounting in the population (e.g., quality of sex, partner quality; Jarmolowicz et al., 2015). Future researchers may also seek out and extrapolate more variables that may influence sexually risky behavior and sexual discounting, such as drug dependence (e.g., Reynolds, 2006) and obesity (e.g., Price et al., 2016), and investigate the potential impact choice overload may have on the risky sexual behavior and delay discounting of sex for dating app users (D'Angelo & Toma, 2017). The findings of the present study were exploratory in nature, and as such replication and further investigation on dating apps and their effect and relationship to sexual discounting and sexually risky behavior is warranted.

Code Availability Not applicable.

Data Availability All data and forms have been stored online and in a protected Cloud drive. All data and materials may be made available upon request.

Declarations

Conflicts of Interest On behalf of all authors, the corresponding author confirms there is no conflict of interest.

Ethics Approval The present study was approved by The Chicago School of Professional Psychology's Internal Review Board in a 3-month review process for expedited approval on October 6, 2019 under the approval identifier IDENTIFIER. All procedures performed were in accordance with the ethical standards of The Chicago School of Professional Psychology and with the 1964 Helsinki Declaration.

Consent to Participate The present study involved human participants. Digital written consent forms were required and completed for all participants, and were read and completed as the first step in participation. All consent forms have been stored digitally.

Consent for Publication Both primary author, Ryan A. Bable, and secondary author, Julie A. Ackerlund Brandt, approve the present study for publication. No individual participant information is to be published.

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