Cocaine-Dependent Adults and Recreational Cocaine Users Are More Likely Than Controls to Choose Immediate Unsafe Sex Over Delayed Safer Sex

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Cocaine users have a higher incidence of risky sexual behavior and HIV infection than nonusers. Our aim was to measure whether safer sex discount rates—a measure of the likelihood of having immediate unprotected sex versus waiting to have safer sex—differed between controls and cocaine users of varying severity. Of the 162 individuals included in the primary data analyses, 69 met the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM–IV–TR*) criteria for cocaine dependence, 29 were recreational cocaine users who did not meet the dependence criteria, and 64 were controls. Participants completed the Sexual Discounting Task, which measures a person's likelihood of using a condom when one is immediately available and how that likelihood decreases as a function of delay to condom availability with regard to 4 images chosen by the participants of hypothetical sexual partners differing in perceived desirability and likelihood of having a sexually transmitted infection. When a condom was immediately available, the stated likelihood of condom use sometimes differed between cocaine users and controls, which depended on the image condition. Even after controlling for rates of condom use when one is immediately available, the cocaine-dependent and recreational users groups were more sensitive to delay to condom availability than controls. Safer sex discount rates were also related to intelligence scores. The Sexual Discounting Task identifies delay as a key variable that impacts the likelihood of using a condom among these groups and suggests that HIV prevention efforts may be differentially effective based on an individual's safer sex discount rate.

Public Health Significance
Cocaine users have a higher incidence of risky sexual behavior and HIV infection than nonusers. Herein, we used a Sexual Discounting Task to measure whether choices to engage in riskier sex now versus delayed safer sex were different in cocaine-dependent adults or recreational users compared to control participants. Both cocaine-using groups had greater safer sex discount rates, indicating the greater relative value of immediate, risky sex in these groups.

Keywords: Sexual Discounting Task, cocaine dependence, recreational users, HIV risk behavior, impulsivity

Over the past 50 years, the American Psychological Association Division of Psychopharmacology and Substance Abuse has evolved by expanding its conceptual and empirical understanding of addiction. One theme that has emerged over the past 25 years in the division has been the behavioral economic perspective (Bickel, DeGrandpre, Higgins, & Hughes, 1990). An important component of this perspective has been the discounting of delayed rewards. Discounting of delayed rewards refers to the decline in value of a reinforcer as a function of the delay to its receipt. Excessive discounting of delayed rewards has been closely associated with various forms and stages of addition (see MacKillop et al., 2011, for a review) to the extent that it has been suggested as a candidate behavioral marker for that process (Bickel, Koffarnus, Moody, & Wilson, 2014). Drug dependence itself may be a direct result of this pattern because the rewards associated with drug ingestion are nearly immediate, while the rewards associated with drug abstinence (e.g., improved health, interpersonal relationships, employment opportunities, etc.) are often considerably delayed (Bickel, Johnson, Koffarnus, MacKillop, & Murphy, 2014). Recently, the procedural components of delay discounting have also evolved to address other important behaviors such as condom use and safer sexual practices (Johnson & Bruner, 2012, 2013).

Addressing condom use is an important consideration for cocaine-using individuals due to the increased rate of sexual HIV risk behavior in this group and a corresponding increased rate of HIV infection (Booth, Watters, & Chitwood, 1993; Bux, Lamb, & Iguchi, 1995; Edlin et al., 1994; Edwards, Halpern, & Wechsberg, 2006; Grella, Anglin, & Wugalter, 1995; Hoffman, Klein, Eber, & Crosby, 2000; Joe & Simpson, 1995; Molitor et al., 1999). Users of cocaine and other stimulants exhibit a high discount rate compared to controls, not only for monetary rewards but also for safer sex with the Sexual Discounting Task (Allen, Moeller, Rhoades, & Cherek, 1998; Camchong et al., 2011; Coffey, Gudleski, Saladin, & Brady, 2003; Heil, Johnson, Higgins, & Bickel, 2006; Johnson, 2012; Johnson, Bruner, & Johnson, 2015; Johnson, Johnson, Herrmann, & Sweeney, 2015; Kirby & Petry, 2004; Moeller et al., 2002; Monterosso et al., 2007; Petry & Casarella, 1999).

The Sexual Discounting Task (Johnson & Bruner, 2012, 2013) is a recently developed measure of HIV risk that is analogous to a monetary discounting task but assesses how the decision to engage in risky sex changes as a function of the delay to condom availability, effectively obtaining a safer sex discount rate. From a set of 60 images of clothed individuals unknown to the participants who vary in gender, race, ethnicity, weight, clothing style, and appearance, participants choose any number of images of individuals they would like to have casual sex with based on appearance alone and are told to imagine that there is no chance of pregnancy. Of those images chosen, participants are then asked to decide which image represents the person they most want to have sex with, the person they least want to have sex with (among those selected individuals they are willing to engage in casual sex with), the person most likely to have a sexually transmitted infection (STI), and the person least likely to have an STI. With respect to the image chosen for each of these categories, participants then complete a series of eight valuation decision trials. The first of these asks how likely the participant is to use a condom when having sex with the individual pictured if a condom is immediately available. The following seven questions ask the participant to specify the likelihood of waiting to use a condom if one is

available after a period of time ranging from 1 hr to 3 months versus having unprotected sex now. Cocaine users performing this task report a high probability of using a condom when one is immediately available, but this probability decreases as a function of delay (Johnson & Bruner, 2012; Johnson, Johnson, et al., 2015). Furthermore, participants were less likely to wait for safer sex for the most desirable image chosen and for the person the participant identifies as having the least likelihood of having an STI. This task has been shown to be reliable up to a period of 1 week and is correlated with self-reported risky sexual behavior (Dariotis & Johnson, 2015; Johnson & Bruner, 2012, 2013). This important set of findings suggests that condom use among stimulant users is not static but highly dependent on the specific perceived attributes of the sexual partner and the delay to condom availability, where even a short delay of a few hours is associated with a large decrease in condom use likelihood.

Recent research suggests that drug use is associated with increased discounting on the Sexual Discounting Task. Opioid-dependent women have been shown to discount delayed safer sex more steeply than non-drug-using control women (Herrmann, Hand, Johnson, Badger, & Heil, 2014); cocaine-use-disordered dependent participants discount safer sex more steeply than matched controls (Johnson, Johnson, et al., 2015); and in young adults, a greater variety of drugs used was associated with greater delay discounting of safer sex (Dariotis & Johnson, 2015). In men who have sex with men, illicit drug use other than cannabis was associated with greater sexual discounting (Herrmann, Johnson, & Johnson, 2015). While previous research has compared the Sexual Discounting Task between cocaine-use-disordered participants and matched non-cocaine-using controls, the relation of recreational cocaine users who do not meet diagnostic criteria to these groups is unknown. Fundamental to diagnostic criteria is the notion that a certain threshold level of symptomatology is typically associated with dysfunction severe enough to be labeled a disorder. Based on this categorization, we should therefore expect symptomatology and use below this threshold to be associated with fewer problematic sequelae such as risky sexual behavior. Therefore, one of the primary aims of the present study was to compare safer sex discounting in recreational cocaine users to that of cocaine-dependent participants and nondependent controls, between which we expected a difference based on previous research (Johnson, Johnson, et al., 2015).

Materials and Method

Participants

A total of 195 individuals participated. To be included, participants were required to be between 18 and 65 years of age. Participants were excluded if they met the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM–IV–TR*; American Psychiatric Association, 2000) dependence criteria for any drug other than nicotine or cocaine or if they had a history of seizures, ferromagnetic implants, or another characteristic that would exclude them from participating in an MRI scan for another component of the experiment not reported herein. After meeting these general criteria, participants were assigned to a group based on their use of cocaine. Participants who met the criteria for cocaine dependence were assigned to the cocaine-dependent

group, participants who had used cocaine recreationally in the past 6 months but did not meet dependence criteria were assigned to the recreational users group, and participants who had no lifetime use of cocaine were assigned to the control group. Participants were recruited from the Houston, TX, and Roanoke, VA, areas.

Procedure

The Sexual Discounting Task was conducted similarly to previous reports of its use (Johnson & Bruner, 2012, 2013). From a predefined series of 60 images of people who vary in appearance and gender, participants selected those individuals they would be willing to have casual sex with based on appearance alone. Images were placed on a table such that all images could be seen at the same time. Participants were told to choose as if they were not currently in a committed sexual relationship, that having casual sex with the chosen people would not constitute cheating, and that there would be no chance of pregnancy. From those images selected, participants chose the image of the person that best fit into each of the four conditions: most want to have sex with, least want to have sex with, most likely to have an STI, and least likely to have an STI. One image was allowed to serve in multiple categories. With respect to each of these four images, participants answered a series of questions. First, using a visual analog scale ranging from 0% to 100% likelihood, participants indicated how likely they were to use a condom if they had sex with the person and a condom was immediately available. This question was followed by a series of analogous questions asking the participant to indicate the likelihood of having unprotected sex now versus waiting some period (1 hr, 3 hr, 6 hr, 1 day, 1 week, 1 month, 3 months) of time to have sex with a condom. Delays within image condition were assessed in ascending order. Participants completed repetitions of the task for each of the four image conditions, with the image conditions presented in a random order.

Participants also completed a Quick Test of Intelligence (Quick Test; Ammons & Ammons, 1962), a risky behavior assessment (National Institute on Drug Abuse, 1993), and measures that have been partially reported elsewhere (Wesley et al., 2014).

Data Analysis

The data from some participants were logically inconsistent, such that preference was inconsistently related to delay or preference increased as a function of delay. Using a framework for identifying logically inconsistent data proposed by Johnson and Bickel (2008), we screened for data that either (a) were highly variable (i.e., two or more instances in a single image condition where the likelihood of using a condom was more than 20 percentage points higher than the next lower delay) or (b) increased as a function of delay (i.e., an increase of at least 10 percentage points in using a condom from the question in which a condom was immediately available to the question in which a condom was available with a 3-month delay; e.g., Johnson, Johnson, et al., 2015). Of the 195 participants who completed the task, four met the first criterion, 24 met the second, and five met both criteria, leaving 69 cocaine-dependent participants, 29 recreational users, and 64 controls. To assess differences between participants with inconsistent and consistent data, chi-square tests and unpaired t tests were conducted as appropriate in GraphPad Prism 6.07

(GraphPad Software, LA Jolla, CA). Participant characteristics in those with consistent data were compared among the three groups with one-way analyses of variance for continuous variables or chi-square tests for nominal variables in SPSS Statistics 23 (IBM Corporation, Armonk, NY).

Sexual Discounting Task data in the no-delay condition were analyzed separately for the most or least want to have sex with and most or least likely to have an STI conditions. Each of these two picture groups was analyzed in SPSS Statistics 23 with a general linear regression model with generalized estimating equations (GEE; Liang & Zeger, 1986) to account for within-subject correlations, an AR(1) correlation structure, normal probability distribution, and identity link function. This test yields partial regression coefficients that indicate the effect attributable to each model term (including covariates) after controlling for the variance associated with each of the other model terms. The primary variables of interest in these models were group and image rating (most vs. least in each category), entered into the model with group as a between-subjects factor and image rating as a within-subject factor. The interaction of these two factors was also entered into the model. Each of the participant characteristic variables found to differ among groups were added as covariates, including recent risky sexual practices (trading sex for drugs or money and/or past-month multiple sexual partners from the risk behavior assessment), sex, smoking status, race, age, and Quick Test of Intelligence score. For these analyses, race was coded dichotomously as White and non-White to eliminate categories with a very small number of participants in some groups. Additionally, Quick Test scores of five participants who did not complete the assessment (three cocaine-dependent and two control) were interpolated as the overall mean of Quick Test scores to allow the data for these subjects to be included. This imputation method is conservative because it serves to, if anything, slightly reduce the overall difference among groups with regard to this variable. All post hoc tests were alpha corrected using the sequential Bonferroni correction algorithm.

Sexual Discounting Task data from the questions where delay to condom availability was manipulated from 1 hr to 3 months were expressed as a percentage of the baseline likelihood to use a condom for each participant. This was done to control for differences among groups in the baseline rate of condom use and to isolate the effect of delay on condom use likelihood. These data were analyzed similarly to the aforementioned zero-delay data, but with delay to condom availability as an additional variable. Group, most or least image rating, and delay to condom availability were entered into the model with all two-way and three-way interactions among these variables, along with each of the aforementioned covariates. This analysis was repeated for each image grouping (i.e., most or least want to have sex with and most or least likely to have an STI).

Results

Differences in Participants With Inconsistent Data

The 33 participants with an inconsistent or illogical pattern of data as described previously were compared to the 162 participants with logically consistent data. These two groups did not significantly differ in proportion of females, racial categories, ethnicity,

risky sexual practices, cocaine use, age, or Quick Test score ($ps >$ .1). However, participants with inconsistent data were more likely to be cigarette smokers, $\chi^2(1) = 8.4$, $p = .004$, and had a lower stated likelihood of using a condom when not delayed in the most want to have sex with, $t(193) = 2.5$, $p = .01$, most likely to have an STI, $t(193) = 2.4$, $p = .02$, and least likely to have an STI, $t(193) = 3.4$, $p < .001$, image conditions, but not the least want to have sex with condition, $t(193) = 1.4$, $p = .2$. This group difference may possibly indicate that these participants differed systematically in their likelihood of using a condom, or it may be the result of undifferentiated responding by participants that was more likely to be nearer to the point of indifference (i.e., 50% likelihood) than the responses of those participants who were more attentive to the task (59% to 89% likelihood; see Figure 1) due to inattention.

Differences in Group Characteristics

The obtained group demographics and other characteristics are displayed in Table 1. Fewer females were in the two cocaine-using groups, and the race of the cocaine-dependent participants was more likely to be African American, while the recreational users and controls were more likely to be Caucasian. The cocaine-dependent group tended to be older than the control group and the recreational users tended to be younger, with all three groups significantly different from each other ($ps < .001$). The cocaine-using groups had a higher incidence of risky sexual behavior and cigarette smoking, with the cocaine-dependent group having a particularly high incidence of both. The cocaine-dependent group had lower intelligence test scores than the other groups, which was significant when compared to the control group ($p = .008$). No significant differences in ethnicity were observed among the groups.
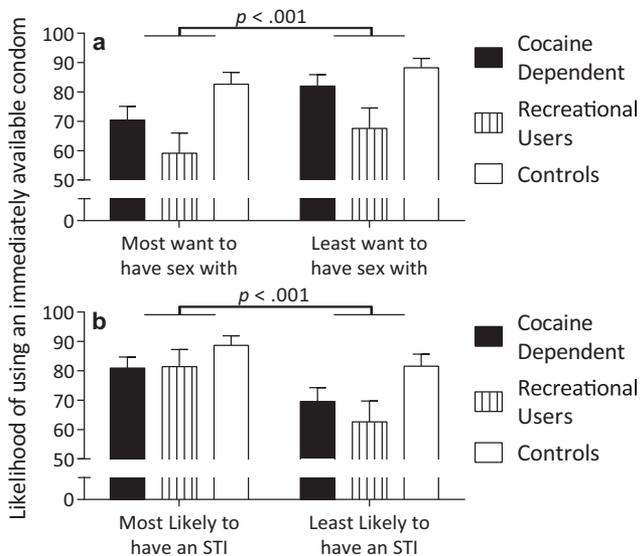

Figure 1. Mean (± standard error of the mean) likelihood of using a condom when one is immediately available across the groups in the two desire to have sex with image conditions (a) and sexually transmitted infection (STI) likelihood image conditions (b). There was a main effect of image type in both image condition pairings.

Likelihood of Using a Condom Without a Delay

The likelihood of using a condom without a delay differed primarily by image condition, although some group differences were noted as well. Participants' stated likelihood of using a condom in the most or least want to have sex with condition was significantly lower with respect to the most want to have sex with image chosen than the least want to have sex with image chosen (Figure 1a), $\chi^2(1) = 11.3$, $p < .001$. There was also a main effect of group, $\chi^2(2) = 11.5$, $p = .003$, with post hoc tests revealing that condom use likelihood in the control group was significantly greater than in the recreational users group ($p = .002$) and trended toward being greater than in the cocaine-dependent group ($p = .054$), with no difference between the cocaine-dependent and recreational users groups ($p = .4$). The interaction between image condition and group was not significant, $\chi^2(2) = 1.5$, $p = .5$, nor was the effect of risky sexual practices, $\chi^2(1) = 0.2$, $p = .7$, smoking status, $\chi^2(1) = 0.2$, $p = .7$, race, $\chi^2(1) = 1.5$, $p = .2$, or age, $\chi^2(1) = 1.3$, $p = .3$. Quick Test score was significantly negatively associated with condom use likelihood, $\chi^2(1) = 5.8$, $p = .02$, and the effect of sex trended toward statistical significance, $\chi^2(1) = 3.6$, $p = .057$, with estimated marginal means of condom use likelihood higher in females (81%) than in males (72%).

In the most or least likely to have an STI condition, condom use likelihood was significantly lower with respect to the least likely to have an STI image than the most likely to have an STI image (Figure 1b), $\chi^2(1) = 23.0$, $p < .001$. Unlike the want to have sex with condition, there was not a main effect of group, $\chi^2(2) = 5.2$, $p = .07$. The interaction between image condition and group was also not significant, $\chi^2(2) = 3.1$, $p = .2$, nor was the effect of risky sexual practices, $\chi^2(1) = 0.8$, $p = .4$, smoking status, $\chi^2(1) = 0.1$, $p = .8$, race, $\chi^2(1) = 0.9$, $p = .4$, age, $\chi^2(1) = 0.5$, $p = .5$, sex, $\chi^2(1) = 2.5$, $p = .1$, or Quick Test score, $\chi^2(1) = 3.4$, $p = .07$.

Effect of Delay on Condom Use Likelihood

With respect to the most or least want to have sex with images chosen by participants, safer sex discount rates significantly varied with respect to group (Figure 2), $\chi^2(2) = 10.2$, $p = .006$. Delay had the lowest effect on condom use likelihood in the control group and the highest effect on condom use likelihood in the recreational users group; participants in this group were significantly different from one another ($p = .006$). Delay had an intermediate effect on condom use likelihood in the cocaine-dependent group, which was not significantly different from the control group ($p = .1$) or the recreational users group ($p = .3$). There were significant main effects of delay, with longer delays associated with less condom use likelihood, $\chi^2(6) = 105.4$, $p < .001$; image rating, with greater condom use likelihood in the least want to have sex with condition than in the most want to have sex with condition, $\chi^2(1) = 14.3$, $p < .001$; and intelligence, with Quick Test scores negatively associated with condom use likelihood, $\chi^2(1) = 18.0$, $p < .001$. The main effects of risky sexual practices, $\chi^2(1) = 0.1$, $p = .8$, smoking status, $\chi^2(1) = 0.2$, $p = .7$, race, $\chi^2(1) = 2.6$, $p = .1$, age, $\chi^2(1) = 2.6$, $p = .1$, and sex, $\chi^2(1) = 3.2$, $p = .07$, as well as the interaction effects of group by image rating, $\chi^2(2) = 0.7$, $p = .7$, group by delay, $\chi^2(12) = 15.4$, $p = .2$, image rating by delay, $\chi^2(6) = 1.8$, $p = .9$, and group by

Table 1
Participant Characteristics of Each Group

Participant characteristic	Cocaine dependent ($n = 69$)	Recreational users ($n = 29$)	Control ($n = 64$)	Statistical comparison
Sex (% female)	20%	14%	52%	$\chi^2(2) = 20.2, p < .001$
Risky sexual behavior[a]	62%	41%	16%	$\chi^2(2) = 30.2, p < .001$
Race				$\chi^2(4) = 41.1, p < .001$
African American	64%	7%	39%	
Caucasian	33%	66%	58%	
Other and/or mixed	3%	28%	3%	
Ethnicity (% Hispanic)	7%	10%	3%	$\chi^2(2) = 2.0, p = .4$
Cigarette smoker	81%	45%	22%	$\chi^2(2) = 47.3, p < .001$
Age ($M \pm SD$)	43.8 ± 9.9	24.6 ± 8.8	36.3 ± 13.9	$F(2, 159) = 29.1, p < .001$
Quick Test score ($M \pm SD$)[b]	36.6 ± 4.0	38.1 ± 5.0	38.9 ± 4.5	$F(2, 154) = 4.4, p = .01$

Note. Categorical variables were compared with chi-square tests, and continuous variables were compared with one-way analyses of variance.
[a] Trading sex for drugs or money and/or past-month multiple sexual partners from the risk behavior assessment (National Institute on Drug Abuse, 1993). [b] Quick Test of Intelligence score (Ammons & Ammons, 1962). Three cocaine-dependent and two control participants did not complete this test.

delay by image rating, $\chi^2(12) = 11.2, p = .5$, were not statistically significant.

In the STI likelihood image comparison, safer sex discount rates also significantly varied with respect to group (Figure 3), $\chi^2(2) = 11.0$, $p = .004$. Delay had the lowest effect on condom use likelihood in the control group and a similar and higher effect on condom use likelihood in the recreational users group ($p = .02$) and the cocaine-dependent group ($p = .01$). The cocaine-dependent and recreational users groups were not different from each other ($p = .7$). There were significant main effects of delay, with longer delays associated with less condom use, $\chi^2(6) = 91.7$, $p < .001$; image rating, with greater condom use in the most likely to have an STI condition than the least likely to have an STI condition; $\chi^2(1) = 8.4, p = .004$, and intelligence, with Quick Test scores negatively associated with condom use likelihood, $\chi^2(1) = 13.7, p < .001$. The main effects of risky sexual practices, $\chi^2(1) = 0.9, p = .4$, smoking status, $\chi^2(1) = 1.2, p = .3$, race, $\chi^2(1) = 0.2$, $p = .6$, age, $\chi^2(1) = 2.2, p = .1$, and sex, $\chi^2(1) = 1.8, p = .2$, as well as the interaction effects of group by image rating, $\chi^2(2) = 2.5, p = .3$, image rating by delay, $\chi^2(6) = 8.4, p = .2$, and group by delay by image rating, $\chi^2(12) = 9.8, p = .6$, were not statistically significant. The group by delay interaction, $\chi^2(12) = 20.9$, $p = .052$, approached significance, likely due to the greater divergence in condom use likelihoods as delay increases between the control group and the two cocaine-using groups.

Discussion

Overall, these data identify key differences in decisions about condom use between cocaine users and control participants. Cocaine users, especially the recreational users, were more likely than the control group to forgo condom use when one is immediately available in some image conditions, but both cocaine-dependent participants and recreational users had greater safer sex discount rates than controls. These data suggest that individuals who use cocaine may not have a substantially greater intention or desire than controls to forgo condom use, but are more willing to do so when even relatively small barriers (i.e., delays) to safer sexual practices are in place. If one considers that we normalized the

discounting curves of Figures 2 and 3 to the no-delay likelihood values of Figure 1, this points to an especially low absolute likelihood of using a condom in the two cocaine-using groups when a delay to condom availability was imposed.

Injection drug use has been the main focus of HIV prevention efforts among drug-using populations (Shoptaw et al., 2013), but these results on the interaction of delay and condom use suggest that different HIV prevention treatments could be effective for different groups of people based on their cocaine use. Less is known about effective prevention efforts among noninjection cocaine users, despite the high rate of HIV infection and risk behavior among this group (Booth et al., 1993; Bux et al., 1995; Edlin et al., 1994; Edwards et al., 2006; Grella et al., 1995; Hoffman et al., 2000; Joe & Simpson, 1995; Molitor et al., 1999). The primary approach to reducing HIV risk behavior among noninjection drug users has been to apply interventions aimed at reducing drug use, which would ideally then lead to a reduction in drug-use-related sexual risk behavior (Shoptaw et al., 2013). Treating drug use should certainly remain a priority, but the present research suggests that certain HIV prevention efforts could be useful adjunct treatments based on individuals' use patterns.

Control participants had low discount rates across the image conditions but were still sensitive to the different image conditions. This suggests that these participants may decide whether to use a condom based, at least in part, on the perceived likelihood of their partner having an STI and/or the perceived desirability of their partner but that once this decision is made, control participants are relatively more willing to wait for a condom if that was their initial choice, even if one is not immediately available. Cocaine-dependent participants and recreational users have a similar stated intention of using a condom as do controls when one is immediately available in the STI likelihood image condition but, unlike controls, they are much more likely to go against their initial decision and change their mind when a delay is imposed to condom availability. This suggests that for cocaine users, the proliferation and widespread availability of condoms would be an important and effective HIV prevention technique because these efforts are likely to reduce or eliminate the delay to condom
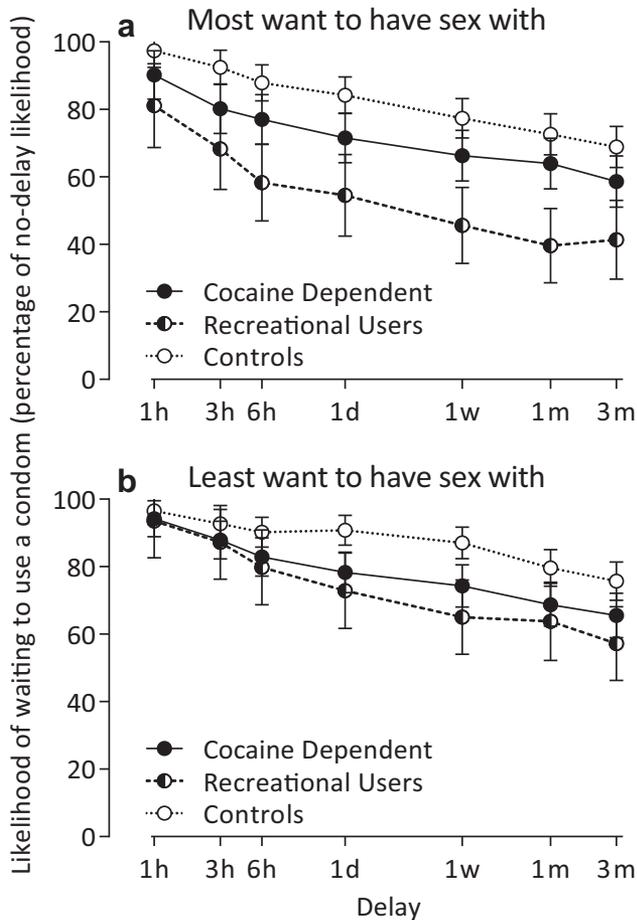
Figure 2. Mean (± standard error of the mean) likelihood of waiting to use a condom, expressed as a percentage of the no-delay likelihood in Figure 1, as a function of delay to condom availability in the most (a) and least (b) want to have sex with image conditions. Note the logarithmic scaling of the *x* axis.

availability. In the want to have sex with image conditions, cocaine users had a lower stated likelihood of using a condom when one is immediately available and were also sensitive to delays to condom availability. For individuals with a high safer sex discount rate, it may be necessary to both increase the availability of condoms and use educational, motivational, or incentive-based prevention schemes to change attitudes and behavior toward condom use. Obtaining a safer sex discount rate with the Sexual Discounting Task may allow practitioners to target specific HIV prevention strategies that would be most likely to benefit that individual. Future research should determine whether such targeted prevention efforts based on safer sex discount rates have increased effectiveness over general, untargeted efforts.

Previous research has identified sex differences in discount rates in the sexual delay discounting task, with females showing a reduced discount rate compared to males (Johnson & Bruner, 2013). The present study did not replicate this effect once all model effects and covariates were taken into account, although the effect of sex approached conventional statistical significance in the most or least want to have sex with image conditions. A novel

participant characteristic identified in the present study was the negative association of the Quick Test of Intelligence scores with the likelihood of using a condom when immediately available and the effect of delay on condom use likelihood. Across conditions, those participants with lower intelligence test scores were less likely to indicate that they would use a condom and were more sensitive to delays to condom availability. Intelligence has been shown across a range of studies to be negatively associated with monetary delay discounting (for meta-analysis, see Shamosh & Gray, 2008), and this association seems to hold for safer sex delay discounting as well.

There were limitations to the present study, the primary one being the imbalanced nature of the groups on various characteristics. The groups in the present study differed on sex composition, incidence of risky sexual behavior, race, smoking status, age, and intelligence; in addition, we were not able to fully examine education among groups due to missing data for many participants. Each of these differences has been reported in the literature previously and is characteristic of cocaine dependence and/or recreational cocaine use (Booth et al., 1993; Bux et al., 1995; Chen &
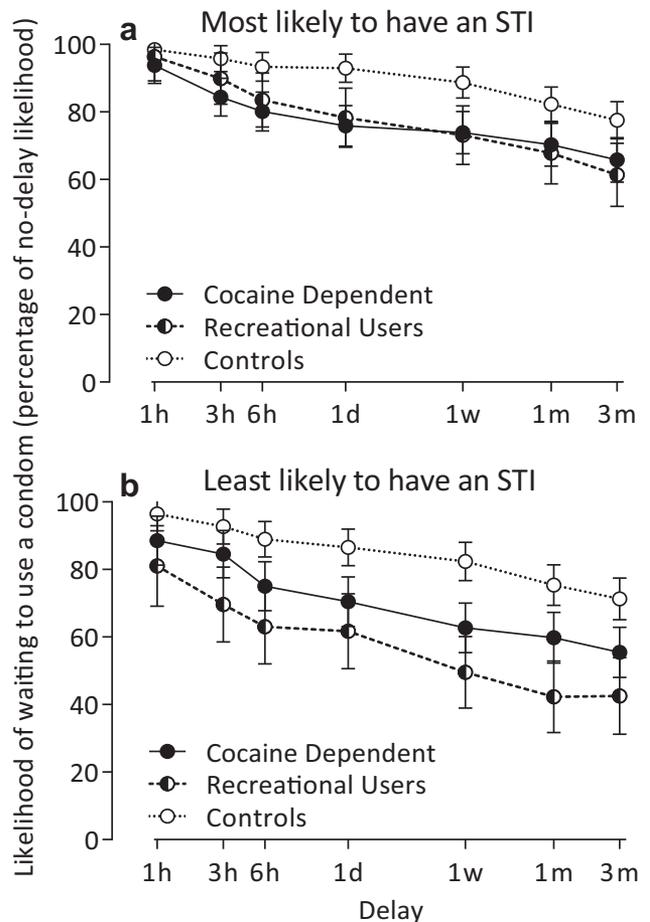

Figure 3. Mean (± standard error of the mean) likelihood of waiting to use a condom, expressed as a percentage of the no-delay likelihood in Figure 1, as a function of delay to condom availability in the most (a) and least (b) likely to have a sexually transmitted infection (STI) image conditions. Note the logarithmic scaling of the *x* axis.

Kandel, 2002; Edlin et al., 1994; Edwards et al., 2006; Grella et al., 1995; Hoffman et al., 2000; Joe & Simpson, 1995; Kandel, Chen, Warner, Kessler, & Grant, 1997; Molitor et al., 1999). Therefore, while our groups reflect the makeup of these groups in society, these differences open the possibility to confounds between the participant characteristics and their sexual attitudes that are not necessarily related to cocaine use. To mitigate the influence of these differences, we included each of the variables that differed among groups as a covariate in our statistical model and found that group differences in line with previous research (e.g., Johnson, Johnson, et al., 2015) persisted after controlling for the effects of these covariates.

This pattern of results in the present study underscores the relevance of the Sexual Discounting Task in assessing sexual risk behavior and decision making about sexual risk. Even when cocaine users and controls indicate a similar likelihood of using a condom when one is immediately available, this task identifies delay as a key variable that impacts the likelihood of using a condom. Across image conditions, both the cocaine-dependent group and the recreational users group had a higher safer sex discount rate than the control group, with the two cocaine-using groups differing little from one another. These results suggest that severity of cocaine use may not be a major factor in the decision-making patterns about condom use among cocaine users.

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