Gender moderates the relationship between impulsivity and sexual risk-taking in a cocaine-using psychiatric outpatient population

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Abstract

Adults who abuse substances are at increased risk for contracting sexually transmitted infections, including HIV. Within this population, sexual risk behaviors have been associated with increased impulsivity. Studies in non-clinical populations showing gender-related differences in sexual decision-making and casual sexual partnering suggest impulsivity has a greater influence on men than women, but these differences have not been documented in substance-using patients. In a sample of 89 adults with recent cocaine use and receiving outpatient psychiatric treatment, we tested the hypothesis that gender moderates the effect of impulsivity on sexual risk-taking. Using logistic regression modeling, we tested the main and gender-moderated effects of task-related impulsivity on the probability of having a casual sexual partner and multiple sexual partners. Results confirmed a significant gender-by-impulsivity interaction; men who were more impulsive on a continuous performance task had significantly higher rates of sexual risk-taking than less impulsive men, but women's impulsivity was unrelated to these outcomes. Impulsive men were over three times as likely as less impulsive men to have a recent casual partner. Implications of these results and suggestions for future research are discussed.

Keywords

Impulsivity; Risk; Gender; Psychiatric; Cocaine; HIV

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1. Introduction

Adults who abuse substances make impulsive decisions about sexual partnerships (Johnson & Bruner, 2012) and engage in high rates of sexual risk behavior that may place them at increased risk for sexually transmitted infections, including HIV (Booth, Kwiatkowski, & Chitwood, 2000; Centers for Disease Control and Prevention, 2013; Leigh & Stall, 1993). Studies involving substance-using adults have demonstrated that impulsivity (measured variably by self-report questionnaires) is positively related to sexual risk-taking. Across studies, men and women who used substances and had more impulsive tendencies reported having more sexual partners, higher rates of sex without a condom, more frequent engagement in sex for trade, generally increased sexual risk-taking (R. A. Black, Serowik, & Rosen, 2009; Hayaki, Anderson, & Stein, 2006; Lejuez, Bornovalova, Daughters, & Curtin, 2005; Lejuez, Simmons, Aklin, Daughters, & Dvir, 2004; Reimers, Maylor, Stewart, & Chater, 2009; Trobst, Herbst, Masters III, & Costa Jr, 2002), and a preference for immediate, riskier sexual opportunities over delayed but safer (condom-protected) alternatives (Johnson & Bruner, 2012). No gender-related differences in the association between impulsivity and sexual risk behavior were reported in those studies.

However, many studies have identified gender-related differences in decision-making about casual sexual encounters, and a predominantly male preference for immediate over delayed sex has been described. For example, in one study men applied less stringent standards than women when rating characteristics of hypothetical short-term sexual partners (Buss & Schmitt, 1993), and were more willing to have sex with a person they had known only a short time. In an experimental task, women considered more criteria when selecting potential short-term partners, and rejected a greater proportion of hypothetical partners than men (Saad, Eba, & Sejean, 2009). In a well-known study conducted on a college campus, spontaneous sexual offers proposed by a stranger of the opposite sex were more likely to be accepted by male than female students (Clark & Hatfield, 1989). Among cocaine-dependent adults, men disproportionately discounted the value of hypothetical delayed, condom-protected sexual opportunities in favor of more immediate, but riskier, sexual offers (Johnson & Bruner, 2013), and college-age men were more likely than women to choose briefer, immediate sexual opportunities over longer but delayed or less probable opportunities (Lawyer, Williams, Prihodova, Rollins, & Lester, 2010). In summary, studies have demonstrated that men were less discriminating than women when choosing short-term sexual partners, and favored immediate over safer sexual offers when given hypothetical choices.

An analysis of national survey data from U.S. adults found that impulsivity was differentially associated with sexual risk behavior for men. In that study, higher scores on self-rated impulsivity predicted lower probability of using a condom with a new sexual partner for men, but not for women (Temple, Leigh, & Schafer, 1993). To determine whether these gender-related differences extend to a clinical population, we tested the hypothesis that the relationship between impulsivity and sexual risk-taking, defined as having a recent casual sexual partner or multiple sexual partners, would be stronger for men

than women in a sample of adults in outpatient psychiatric treatment reporting recent cocaine use.

2. Methods

2.1 Participants

Data for this study are a subset of pre-intervention data collected for a clinical trial comparing two behavioral interventions targeting cocaine use and sexual risk behavior (clinicaltrials.gov # NCT01327586). Adults recruited for participation were receiving outpatient treatment at state-operated mental health centers, reported any cocaine use in the past 60 days, and received Social Security disability payments as their primary income. Recent sexual risk behavior was *not* an inclusion criterion.

Of the 108 adults who provided written informed consent for participation in the clinical trial, 89 were included in these analyses. Eight individuals were excluded for missing data on target variables, and 11 were excluded because their scores on the primary impulsivity measure were worse than chance, suggesting misunderstanding of the task. Participants self-reported their biological sex/gender, age, race/ethnicity, years of education, employment, marital status, and sexual orientation. Race was measured by two dichotomous indicators, African-American and Hispanic, with participants identifying Caucasian or "Other" race constituting the reference group. The sexual orientation variable was converted to a dichotomous indicator (heterosexual or not) because only nine participants reported homosexual or bisexual orientation. Axis-I psychiatric diagnoses were determined by the Structured Clinical Interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 2012).

Participants ranged in age from 19–57 years (*Mean*=43, *SD*=9.3), and the majority (n=53; 60%) were men. Forty-nine (55%) participants were African-American, 23 (26%) were Caucasian, 14 (16%) were Hispanic, and 3 (3%) reported "Other" race/ethnicity. Participants reported 7–16 years of education (*Mean*=11.5, *SD*=1.8) and 28 (32%) had worked at all in the past three years. Forty-nine (55%) participants had a schizophrenia-spectrum disorder, 15 (17%) had major depressive disorder, 14 (16%) had bipolar disorder, 10 (11%) had generalized anxiety disorder, 4 (4%) had psychosis not otherwise specified, 12 (13%) had more than one disorder, and one participant had no Axis-I disorder. For analyses, the 9 participants with generalized anxiety disorder without co-occurring psychotic or mood disorder (n=8) or no Axis-I disorder (n=1) were the reference group. Most participants (n=75; 84%) reported heterosexual orientation, 6 (7%) bisexual, 3 (3%) homosexual, and 5 (6%) did not report sexual orientation. Two participants (2%) were married, 3 (3%) were cohabiting with a partner, 21 (24%) were divorced, widowed or separated, 62 (71%) were never married, and one did not report marital status. Thirty-four participants (38%) had a primary sexual partner. Of the 83 participants who provided their HIV status, 5 (6%) were HIV positive.

2.2. Measures

2.2.1. Sexual risk behaviors—Sexual risk behaviors, assessed by Audio Computer-Assisted Self-Interview, included information about sexual partners in the last 28 days,

exchange of sex for money, drugs, or other goods, and use of drugs or alcohol at the most recent sexual experience. A primary partner was defined as a spouse, fiancée or other steady partner. A casual partner was defined as any individual who was not a primary partner (regardless of whether the participant had a primary partner) with whom the participant had sexual contact *or* a *primary* partner with whom the participant exchanged sex for goods, a friend with whom the participant had sex occasionally, or someone with whom the participant had sex only once. Having sexual contact with more than one person in the past 28 days constituted having multiple partners.

2.2.2. Impulsivity—Impulsivity was assessed by The Immediate and Delayed Memory Task (IMT/DMT 2.0) (Dougherty & Marsh, 2003; Dougherty, Marsh, & Mathias, 2002; Dougherty, Marsh, Moeller, Chokshi, & Rosen, 2000) . The IMT/DMT has demonstrated validity as a measure of impulsivity for individuals with psychiatric disorders. Scores have reliably differentiated respondents with psychiatric disorders from healthy controls, and correlated significantly with other measures of impulsivity (e.g., Barratt Impulsiveness Scale, Trail Making Test, Time Estimation Task) as well as real-world indicators of impulsivity or impulse control deficits (e.g., physical aggression). The computer-delivered assessment involves two continuous performance tasks testing memory and impulsivity-related responses. In the IMT, participants attended to 5-digit numbers presented on a computer screen for 0.5 seconds, one every second, for five minutes. Participants were instructed to depress the button on the mouse if two consecutive numbers matched, and to withhold the response if they differed. The DMT required participants to discriminate matching and non-matching number pairs presented 3.5 seconds apart and separated by a filler number (12345) presented three times. Two blocks of each task (IMT then DMT) were presented in a 21.5-minute trial. The parameter of interest was IMT-A-prime (A'), a measure of discrimination accuracy between signal (a matching number) and noise (a nonmatching number). A' values range from 0.5 (chance) to 1.0, with higher values indicating better stimulus discrimination and less impulsive responding. Fourteen participants who had valid IMTA' scores had missing or invalid DMT-A' scores, suggesting participants stopped responding during the DMT or misunderstood the task. Participants were paid $10 for engaging in the IMT/DMT task, regardless of performance.

2.2.3. Substance use—Days of cocaine, alcohol, opiate, and marijuana use in the 90 days prior to study enrollment were measured by a timeline follow-back (TLFB) calendar (Sobell & Sobell, 1992). TLFB is an interview technique that uses reference to dates and events on a calendar to cue accurate recall of target events over a specific time period. The technique has provided desirable test-retest reliability of retrospective self-reports of alcohol use (Sobell, Maisto, Sobell, & Cooper, 1979) and reliable and valid substance use data for adults with psychiatric and substance use disorders (Carey, Carey, Maisto, & Henson, 2004; Haddock et al., 2009; Hjorthøj, Hjorthøj, & Nordentoft, 2012).

2.3. Data analysis

Descriptive analyses summarized self-reported sexual partnerships in the past 28 days and performance on the IMT/DMT. Chi-square analyses compared male and female participants on dichotomous variables, and t-tests compared groups on continuous variables.

Using logistic regression modeling, we estimated the odds of having a casual sexual partner in the last 28 days, entering predictors in four sequential blocks. Demographic variables gender, age, race, years of education, having a primary sexual partner (in lieu of marital status) and psychiatric diagnoses were entered first, pre-treatment days of cocaine use, and substance use at the time of last sexual encounter were entered second, impulsivity (IMT A', mean-centered) was entered third; and the gender-by-IMT-A' interaction was entered last. Non-significant predictors besides demographic variables and components of the interaction term were removed from the model before entering the next block. We then replicated the final model with a second dichotomous outcome: having multiple sexual partners.

2.3.1 Secondary analyses—In secondary analyses including subsets of 84 cases with data for sexual orientation and 83 cases with data for HIV status, we estimated the same logistic models, including those additional variables as predictors in separate models. With the 75 cases that had DMT-A' parameter data, we replicated the final logistic regression model described in section 2.3, substituting DMT-A' (mean-centered) and gender-by-DMT-A' interaction for IMT-A' and genderby- IMT-A' interaction, respectively.

2.3.2 Post hoc analyses—Post-hoc descriptive analyses compared risk outcomes for men and women at/above and below the median IMT-A' score. All analyses were conducted using SPSS 19.0 (IBM, 2010).

3. Results

3.1 Gender-related differences on participant characteristics

Men and women differed significantly on psychiatric diagnoses and age. Men were more likely to have a diagnosis of schizophrenia spectrum disorder (68% and 36%, respectively) and women were more likely than men to have a diagnosis of MDD (28% and 9%, respectively). Women were slightly older than men (*Mean*=45 years, *SD*=7.6; *Mean*=41 years, *SD*=9.9, respectively, *p*=.02). There were no gender differences on years of education, race distribution, probability of having a primary sexual partner, sexual orientation, or HIV status.

3.2 Sexual risk behavior

Twenty-eight (32%) participants reported having a casual sexual partner in the past 28 days, 19 (21%) reported having multiple partners, 12 (13%) had exchanged sex for money, drugs, or other goods, and 22 (25%) reported their last sex was under the influence of drugs or alcohol. Men and women did not differ on these variables.

3.3 Impulsivity

IMT-A' scores ranged from .51 to .92 (*Mean*=.72, *SD*=.10). DMT-A' scores (n=75) were similarly distributed, ranging from .50 to .96 (*Mean*=.72, *SD*=.09). Men and women performed similarly on both tasks, and were equally likely to have a missing value for DMT-A'.

3.4 Baseline substance use

Participants reported 1–90 days of pre-treatment cocaine use (*Mean*=16.0, *SD*=20.5), 0–90 days of marijuana use (*Mean*=14.5, SD=28.8); 0–90 days of alcohol use (*Mean*=13.2, *SD*=20.3); and 0–37 days of opiate use (*Mean*=1.5, *SD*=5.4). Men and women did not differ on reported use of any substance.

3.5 Primary logistic regression models

Tests for multicollinearity confirmed that no variance inflation factor exceeded 3.5, and no pair of independent variables was correlated greater than *r*=.74 (mean-centered IMT-A' with the gender-by-IMT-A' interaction); all other variable pairs were correlated *r*<.50.

For both logistic regression models (Casual Partner and Multiple Partners), years of education were negatively associated with the outcome (Table 1); participants who were more educated were significantly less likely to report risky sexual partnerships. Substance use at the time of last sexual encounter was positively associated with having a casual partner, but not having multiple sexual partners.

As hypothesized, gender moderated the effect of impulsivity for both outcomes, as indicated by a significant interaction term. Controlling for other variables in the model, males who were less discriminating on the IMT were more likely to report having a casual sexual partner and multiple partners in the past 28 days, but for women, IMT-measured impulsivity was not significantly associated with either outcome (Figures 1 and 2).

Controlling for other variables in the model, baseline cocaine use was not a significant predictor and was trimmed from the final model.

3.6 Secondary regression models

In secondary analyses, neither heterosexual orientation nor HIV status predicted risk outcomes, after controlling for participant demographic characteristics.

Substituting DMT-A' for IMT-A' as the measure of impulsivity, the results of both models (Casual Partner and Multiple Partners) were replicated. Predictors that were statistically significant in the original models were significant in the replicated models, with the exception that in the Casual-Partner model, s*ubstance use at last sexual encounter* was not statistically significant (*p*=.07). This single difference may be accounted for by the decreased statistical power associated with the reduced sample size.

3.7 Post-hoc analyses

Men whose IMT-A' scores were below the median (i.e., were more impulsive) were over 3 times as likely as men with scores at or above the median to have a casual partner in the past 28 days (48% vs. 15%) and almost twice as likely to report multiple partners in the same time period (22% vs. 12%). Conversely, women whose IMT-A' scores were below the median were not more likely than women with scores above the median to report having a casual partner (30% and 31%, respectively), or multiple partners (25% and 30%, respectively).

4. Discussion

In both models, men whose responses were more impulsive on the IMT were more likely than less impulsive men to report having a casual or multiple sexual partners. Women did not differ from men in measured impulsivity nor in reported sexual partners, but for women, these variables were unrelated.

These results provide support for our hypothesis that impulsivity is a stronger predictor of sexual risk-taking for men than for women, and results are logically consistent with sexual delay discounting studies demonstrating men's differential preference for immediately-available sex despite unfavorable (risky, time-limited) circumstances.

Importantly, studies of adults with substance use disorders have shown mixed results about whether men or women are more likely to engage in sexual risk-taking (Brooks et al., 2010); our study shows no difference between genders. However many studies have demonstrated gender-related differences in intrinsic motivation for sex, "sex for its own sake", that are consistent with there being a unique association between impulsivity and sexual risk-taking in men.

In an extensive review of literature documenting gender differences in sex drive, Baumeister and colleagues (Baumeister, Catanese, & Vohs, 2001) determined men consistently report more frequent and more intense thoughts about sex, experience unwanted and intrusive thoughts about sex, and report more frequent and more easily-stimulated sexual desire, and more frequent spontaneous sexual arousal than women. Additionally, across studies men reported desiring more frequent sex and a greater number of lifetime sexual partners than women, and men pursued access to sexual opportunities at risk of, or actual, greater cost. Further, men were significantly less likely than women to tolerate sustained periods without a sexual outlet; the vast majority of men asked reported having sex to alleviate sexual tension whereas women were more likely to report non-sexual outlets such as physical activity. Whereas women were significantly more likely to perceive the goal of sex as love and emotional intimacy, men overwhelmingly reported a more immediate goal; to relieve sexual desire.

We propose that men's heightened sexual desire and preference for immediately-available sex make them more vulnerable than women to impulsive and risky decisions about sexual partners. Men with greater impulsive tendencies more generally appear to be at particularly high risk for harm from unsafe sexual contact.

One intriguing possibility raised by these results is that risk reduction strategies for men might profitably target reducing the indiscriminate aspects of sexual risk-taking, such as decisions relating to casual partnerships. The study raises the question of whether men at particularly high risk for harm because of heightened impulsivity may be taught to exercise more advantageous discrimination through targeted training around impulsive decision-making. A similar generalization of training in reduced impulsivity was suggested in our study with substance using adults in which targeted instruction around impulsive spending was significantly associated with concurrent reductions in substance use and monetary delay discounting (A. C. Black & Rosen, 2011).

A notable secondary result of our study is that substance use at the time of last sexual event, but not baseline cocaine use (variables not highly correlated; $r=-.04$), predicted greater likelihood of a casual sexual partnership. This finding highlights the relevance of timing, rather than rate of substance use in its effect on sexual risk-taking for this sample.

We acknowledge the preliminary nature of these results and limitations of our study, including the small size and heterogeneity of the sample. It is not clear to what extent the results from this convenience sample may generalize to the population of adults with co-occurring psychiatric and substance use disorders. Because the sample varied widely on demographic characteristics, it is possible that the gender-related differences described may be accounted for by a variable not included in these analyses. For example, it is possible that poor performance on the IMT may relate to cognitive deficits or unmeasured psychiatric symptoms that also account for unstable, uncommitted sexual relationships. Finally, whether the study's results are replicable with other measures of impulsivity or sexual risk behavior has not been tested.

5. Conclusions

In this study, impulsive responses on a continuous performance task were independently associated with two sexual risk-taking outcomes for men, but not for women. Future studies should further examine the relationship between behavioral impulsivity and sexual risk behavior to determine whether interventions targeting more general impulsivity in decision-making tasks might reduce harm related to sexual risk-taking for men.

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Highlights

• We model data from cocaine-using adults in outpatient psychiatric treatment.

• We assess whether gender moderates the impulsivity-sexual risk-taking association.

• We note a significant gender-by-impulsivity interaction for two risk outcomes.

• Impulsivity was associated with sexual risk-taking for men but not women.

• More impulsive men were three times more likely to have casual sexual partners.
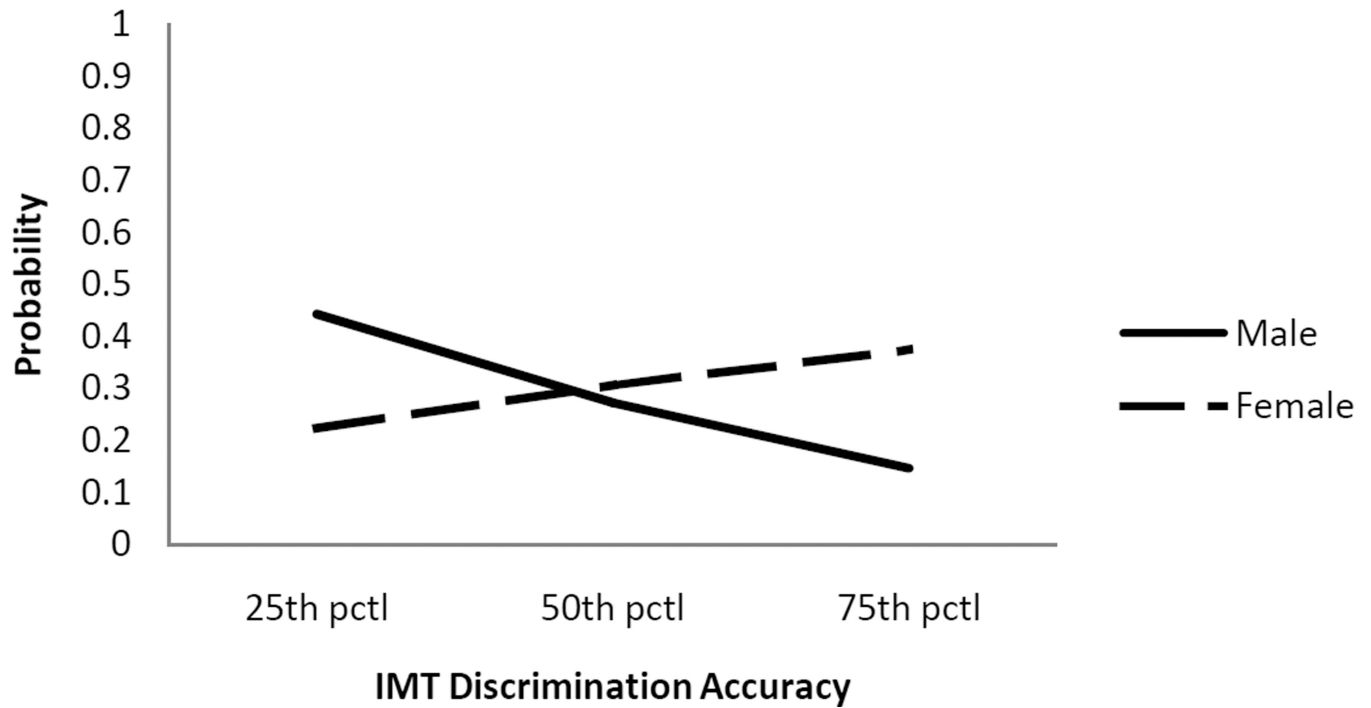
Casual Partner by IMT-A' and gender

Fig. 1.
Model-derived gender-moderated relationship between IMT-A' and probability of having a casual sexual partner (only gender, IMT-A' and gender-X-IMT-A' in the model). The unstandardized conditional effect of IMT-A' for females =2.11 (*p*=.56); for males = −10.39 (*p*<.01).
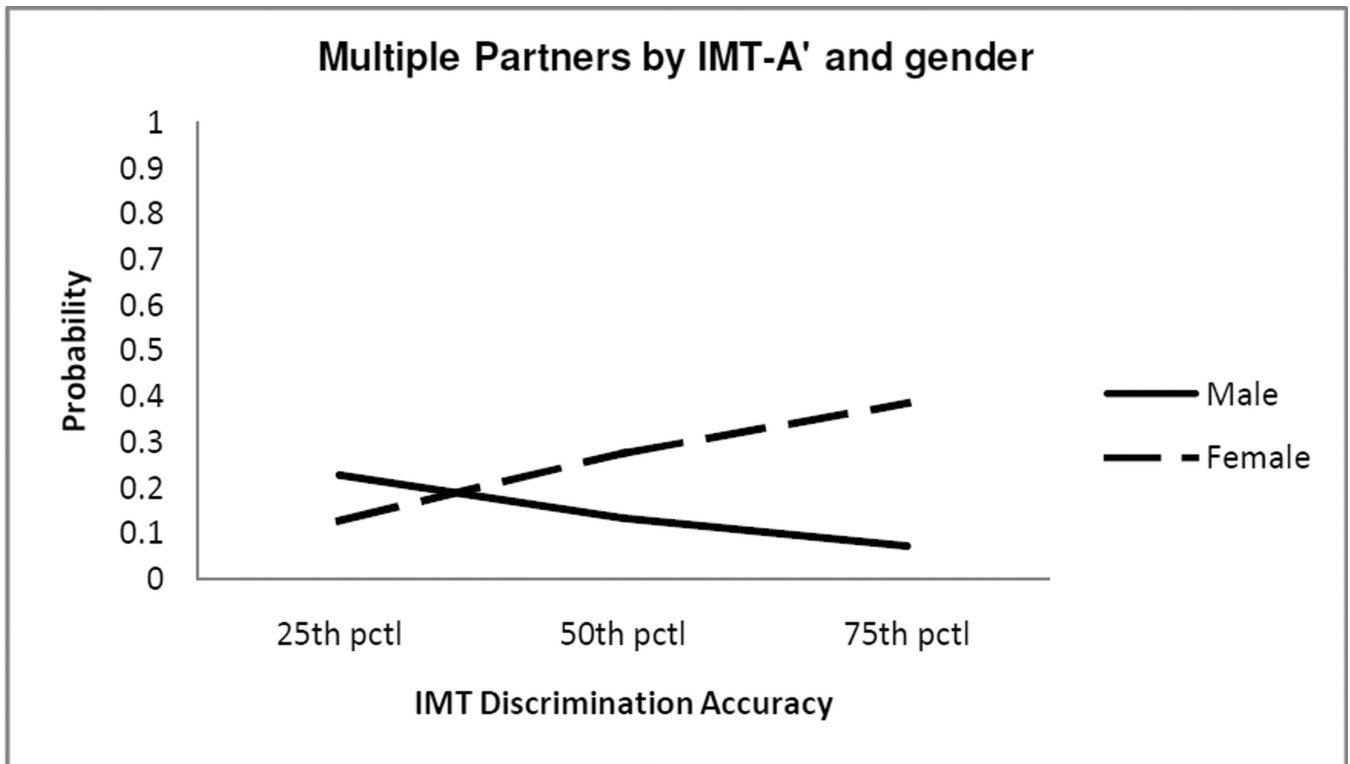
Fig. 2.
Model-derived gender-moderated relationship between IMT-A' and probability of multiple sexual partners (only gender, IMT-A' and gender-X-IMT-A' in the model). The unstandardized conditional effect of IMT-A' for females = 3.26 (p=.40); for males =−9.12 (p<.05).

Table 1

Unstandardized regression coefficients for logistic regression models.

| | Casual Partner | | | | Multiple Partners |
	Block 1	Block 2	Block 3	Final	Replication
Gender	0.63	0.63	0.72	0.30	−0.80
Age	0.03	0.03	0.04	0.01	0.02
Regular Partner	−0.66	−1.09	−0.97	−1.04	0.42
African American	0.43	0.36	0.62	0.73	0.74
Hispanic	0.02	−0.17	0.01	0.70	0.97
Years Education	**−0.32***	**−0.39***	−0.33	**−0.39***	**−0.42***
Schiz-Spec D/O	−1.13	−1.14	−1.83	−1.18	−1.03
Bipolar D/O	−1.35	−1.70	−2.17	−2.31	−0.65
MDD	−0.25	−0.42	−0.71	−0.33	−0.81
Psychosis NOS	0.33	0.56	0.29	0.90	0.19
Bsln Cocaine Use	---	−0.10	---	---	---
SU/Last Sex	---	**1.70****	**1.61****	**1.60***	0.06
IMT-A'	---	---	−5.22	3.76	5.97
Gender X IMT-A'	---	---	---	**−16.43***	**−17.96***
R^2_L	.09	.17	.19	.25	.19

Note:

* p .05

** p .01

R^2_L=1-(-2LLModel/-2LLNull).