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The Impact of Sexual Arousal on Sexual Risk-Taking and Decision-Making in Men and Women

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Abstract Sexual arousal has emerged as an important contextual feature in sexual encounters that can impact safer-sex decision-making. We conducted two experiments that investigated the effects of sexual arousal among male and female participants. Experiment 1 ($N = 144$) examined the impact of sexual around on sexual health decision-making. Sexually explicit and neutral video clips as well as hypothetical romantic scenarios were used to evaluate the effects of sexual arousal on sexual risk-taking intentions. Men and women who reported higher levels of sexual arousal also displayed greater intentions to participate in risky sexual behavior (e.g., unprotected sex with a new sex partner). Experiment 2 ($N = 122$) examined the impact of sexual arousal on general risk-taking, using the same videos clips as in Experiment 1 and a modified version of a computerized Blackjack card game. Participants were offered a chance to make either a risky play or a safe play during ambiguous conditions. Increased sexual arousal in Experiment 2 was associated with impulsivity and a greater willingness to make risky plays in the Blackjack game. These findings suggest that, in situations where there are strong sexually visceral cues, both men and women experiencing strong sexual arousal may have lower inhibitions and may experience impaired decision-making. This phenomenon may have an impact during sexual encounters and may contribute to a failure to use appropriate prophylactic protection.

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Introduction

Despite possessing knowledge about STI/HIV risk (Ariely & Loewenstien, 2006), many young adults are still not using condoms consistently (MacDonald & Hynie, 2008; Rotermann & McKay, 2009). This may be due to both an underestimation of the likelihood of engaging in sexual activity (thus, under-preparation) (MacDonald & Hynie, 2008) as well as situational and cognitive factors that may influence the decision-making process, such as sexual arousal (Ariely & Loewenstien, 2006; Canin, Dolcini, & Adler, 1999; George et al., 2007; Norris, Masters, & Zawacki, 2004; Strong, Bancroft, Carnes, Davis, & Kennedy, 2005). Decisions to use or not use condoms typically occur when a sexual situation is already underway (George et al., 2007; Norris et al., 2004), that is, when one or both parties may already be experiencing the effects of sexual arousal. The aims of the current study were to (1) investigate gender-specific effects of sexual arousal on safer-sex decisions, and (2) identify the extent to which the effects of sexual arousal could extend to other, non-sexual, risk-taking situations.

Sexual Arousal and Condom Use

Sexual arousal has gained recognition as an important situational factor that can impact condom use decisions. Inconsistent condom users commonly reference strong feelings of passion and desire, both strongly associated with sexual arousal, as the reason for their inconsistent condom use (Patel, Gutnik, Yoskowitz, O'Sullivan, & Kaufman, 2006; Strong et al., 2005). It has been found that men and women who reported a strong experience of sexual

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arousal at a sexual encounter were least likely to have used a condom (Boldero, Moore, & Rosenthall, 1992). Further, experimental studies have found that sexual arousal can result in decreased condom use intentions in both men and women (Abbey, Saenz, & Buck, 2005; Ariely & Loewenstien, 2006).

Despite the recognition afforded to the effects of sexual arousal, relatively few studies have examined its independent effects on decision-making (i.e., without combining it with alcohol or other factors). Further, the majority of studies have asked participants to retrospectively reflect on past experiences (as in Strong et al., 2005). This poses a considerable challenge, as it may be difficult for participants to accurately recall their own behavior/thoughts when they are "cold," that is, when they are removed from the heat of a sexual situation by time and space (Loewenstein, 1996). Thus, there is a need for research to examine the effects of sexual arousal while participants are, in fact, experiencing higher levels of sexual arousal.

The Importance of Examining Combined Gender Samples

Another issue in this area of research is that a large proportion of previous work has focused on the effects of sexual arousal on cognition in men only (as in Ariely & Loewenstien, 2006). The paucity of research empirically investigating the effects of sexual arousal in both women and men is of concern. Condom use decision-making may occur within individuals, but condom negotiation (the proposal to use some form of barrier during sexual activity—typically a male condom; Norris et al., 2004) is always, to some degree, a dyadic process that involves the participation, or at least the cooperation, of both sexual partners (Harvey et al., 2006; Norris et al., 2004).

During condom negotiation, either partner may initiate the negotiation process; however, among heterosexual couples, condom negotiation is most frequently left to the female partner (Norris et al., 2004; Troth & Peterson, 2000). To "use" a male condom, a heterosexual woman must successfully request and insist that her male partner wear one (Harvey et al., 2006; Norris et al., 2009). Norris et al. posited that sexual decision-making in a heterosexual woman is a multistage process that involves a series of personal appraisals of the situation, as well as interactions with her partner. Ultimately, the appraisals she makes typically occur when a sexual situation is already underway, that is, while she may already be experiencing increased sexual arousal. These appraisals will influence whether or not she requests and/or insists on condom use, what strategies she may use, and how she will respond if her partner refuses to use one.

Norris et al. (2009) have shown that sexual arousal may have an impact on this appraisal processes, resulting in increased unprotected sex intentions and decreased condom insistence. Harvey, Thorburn Bird, Galavotti, Duncan, and Greenburg (2002) pointed out that condoms are used more frequently in heterosexual dyads where condom use decision-making is either shared or left up to the woman. These findings suggest that joint decision-making (or female-dominated decision-making) can increase overall condom use consistency among heterosexual couples. Thus, understanding more about how condom use decision-making occurs in both men and women is crucial for informing future interventions aimed at encouraging more frequent and consistent condom use among heterosexual dyads. Sexual arousal is obviously a very important factor that has the potential to strongly influence sexual decision-making, particularly regarding condom use and condom negotiation (Norris et al., 2004), among both men and women.

The Scope of Sexual Arousal's Impact

Another important aspect of sexual arousal in need of examination is the scope of its effects. There are some who view sexual arousal as a component of the motivational drive for sexual gratification. As such, sexual arousal is seen as a response to sexually visceral contextual cues (i.e., sexually arousing stimuli), which indicate that sexual gratification may be available (Ditto, Pizarro, Epstein, Jacobson, & Macdonald, 2006). Although deprivation of sexual gratification is not life threatening, the drive to obtain it may still affect cognition in a similar way as other drives, like thirst and hunger (Loewenstein, 1996). Thus, it may be that sexual arousal incites a form of myopia, or tunnel vision, where attentional focus is placed on the object of desire, in this case, sexual gratification, and on the self (i.e., one's own enjoyment/pleasure), rather than being placed on more distal factors such as concern for others or on future considerations (i.e., avoiding infections and/or unwanted pregnancy) (Blanton & Gerrard, 1997; Ditto et al., 2006).

In line with this theory, it has been postulated that visceral cues only influence the modality with which they are associated, that is, a hungry person would make short-sighted decisions related to eating (e.g., by eating chocolate cake for supper), but not related to finances or sexual activity (Loewenstein, 1996). To wit, it is possible that persons who are sexually aroused may have difficulty making rational decisions about sexual behaviors, due to their motivation and attention being drawn toward sexual gratification. However, this concept has enjoyed little empirical scrutiny. Further, the effects of sexual arousal on attentional focus in healthy women have not yet been given much empirical attention. However, strong sexual arousal has been linked to a failure to use prophylactics (Boldero et al., 1992; Suvivuo, Tossavainen, & Kontula, 2009). Indeed, Suvivuo et al. found that many female participants reported lower condom use in situations where they experienced intense sexual arousal during the encounter. These women reported experiencing a sense of helplessness, which they attributed to the strong influence of sexual arousal. This evidence is in agreement with Loewenstein's (1996) and Ditto et al.'s (2006) postulation that sexually impulsive behavior will increase when sexual arousal (a visceral factor) is intense. It is thought that this is because strong sexual arousal is an indicator/symptom of a strong attentional pull toward stimuli associated with sexual pleasure. And

indeed, Prause, Staley, and Finn (2011) found that participants reported a greater intention to engage in sexual intercourse when sexually aroused.

In contrast, it may be that sexual arousal has more broad effects, beyond the modality of sexual situations—much like descriptions of alcohol myopia (Ariely & Lowenstein, 2006; Steele & Josephs, 1990; Strong et al., 2005). For example, an increase in sexual arousal has been shown to be associated with a motivational shift toward a more enjoyment-oriented state, a state typified by a propensity for risky behavior in general (Skakoon-Sparling & Cramer, 2014). Baker and Maner (2008) attempted to investigate the effects of sexual arousal in both male and female participants on tasks designed to elicit risk-taking. They found that heterosexual male participants displayed an increase in risk-taking after viewing attractive female faces, but that viewing attractive male faces had no such effect for women. This was interpreted as being the result of increased mating motivation after viewing the photos, which resulted in increased risk-taking among male participants only, due to the high degree of intrasexual competition for mates among men. These findings are interesting, but limited by the methodology used. For instance, it could be that the stimuli employed (viz. photographs of attractive faces) were not sufficiently stimulating to produce effective sexual arousal in females. It is our postulation that stronger visceral stimuli may therefore be needed (Chivers, Seto, & Blanchard, 2007; Suschinsky, Lalumiére, & Chivers, 2009). Specifically, it may be that female sexual arousal levels need to reach a higher threshold before effects can be detected and these higher levels of sexual arousal response may be elicited through the use of more explicitly sexual stimuli (Chivers et al., 2007). Further study is necessary to determine whether sexual arousal has an effect on general risk-taking, beyond the scope of sexual decision-making and whether these effects are similar among sufficiently sexually aroused men and women.

The Current Study

The present study aimed to expand the research on safer-sex practices by investigating the effects of sexual arousal on risk-taking and decision-making in women as well as men. Using sexually explicit video clips, a heightened state of sexual arousal was induced in participants. The primary goal was to determine whether the effects of sexual arousal on women were similar to the patterns previously seen in men (Ariely & Loewenstein, 2006; Baker & Maner, 2008), that is, whether sexual arousal can have a detrimental effect on participants' risk-taking and safer-sex behavioral intentions, regardless of gender. The second goal of this study was to determine whether the impact of sexual arousal relates only to sexual situations or whether it creates a more broad myopic effect and affects general risk-taking as well. To accomplish these goals, two experiments were conducted.

Experiment 1 investigated participants' sexual decision-making using hypothetical sexual scenarios. It was hypothesized that participants (both male and female) experiencing a heightened state of sexual arousal would be more likely to report intentions to engage in unsafe sexual activities than their non-aroused counterparts in the control condition. In Experiment 2, the effects of sexual arousal on risk-taking were investigated in a more implicit/abstract and general context, using a gambling card game (a modified version of Blackjack). Participants were offered a chance to make either a risky play or a safe play during ambiguous conditions. It was hypothesized that both male and female participants experiencing a heightened state of sexual arousal would make more risky plays than their counterparts in the control condition.

Experiment 1: Sexual Decision-Making

Method

Participants

A total of 144 undergraduate students were recruited using the University of Windsor psychology research pool. This participant pool requires that students complete a short screening questionnaire to determine eligibility for all studies. Eligible participants for this investigation indicated that they were heterosexual (during screening, participants were asked to indicate their gender and their sexual attraction target: women, men, both, neither) and had previously engaged in vaginal or anal sex at least once. The data from participants in the experimental condition who did not attain the cut-off level of self-reported sexual arousal (a rating above 3 on a scale of 1–10[1]) and participants in the control condition who exceeded their cut-off level (a rating above 2) were not included in the final analyses (the sexual arousal manipulation check is described below). By these criteria, 29 participants were excluded—9 women and 2 men from the experimental condition and 10 women and 8 men from the control condition. Additionally, two participants elected to discontinue the experiment before it was complete because they reported being uncomfortable with the material. In total, data from 113 participants (80 women and 33 men) were used, with 46 participants in the experimental condition and 67 in the control condition. Demographic data indicated that eliminated participants did not differ significantly from included participants.

Participants ranged in age from 18 to 32 years ($M = 23$). Fifty-one percent of participants indicated that they were involved in a monogamous relationship, while 41 % (combined) indicated they were single or in a casual relationship. Fifty percent of participants reported having had sex in the past 7 days and 55 % reported that they had not used a condom the last time they had sex. Only 27 %

[1] An average sexual arousal score that was below the median was chosen as the cut-off because participants tend to underestimate their physiological experience of sexual arousal when asked to report their subjective sexual arousal level (Chivers, Seto, Lalumiere, Laan, & Grimbos, 2010).

of participants reported using condoms "every time," while 35 % of participants (combined) reported that they typically use condoms "rarely" or "never." The mean number of reported lifetime sex partners was 6 ($SE = 0.63$).

Measures

Video Clips Eight video clips, each approximately 2 min in length, were employed in the study. The four video clips for the experimental condition were taken from the Candida Royalle Film, *Under the Covers* (Royalle, 2007), and depicted graphic but non-violent and non-demeaning sexual acts, including oral sex and condom-less penetrative vaginal sex. Three video clips portrayed penetrative vaginal intercourse between male and female partners and one video clip portrayed a heterosexual couple engaging in fellatio and then cunnilingus. Candida Royalle's films are frequently used by researchers (e.g., Suschinsky et al., 2009), as they tend to be appealing to both women and men. The four non-erotic control video clips were non-sexual and non-violent in nature, but depicted interactions between male and female characters from popular television shows and movies (e.g., a clip from the Pixar film *WALL-E* was used; Morris & Stanton, 2008). Participants viewed either four sexual clips (experimental condition) or four non-sexual clips (control condition). Each set of video clips were presented in a randomized order.

Mood Assessment/Manipulation Check Affective state was assessed using a "mini mood scale," adapted from Mayer and Gaschke's (1988) Brief Mood Introspection Scale. Participants were asked to rate their subjective sexual arousal on a Likert scale ranging from 1 (not at all sexually aroused) to 9 (extremely sexually aroused). Each participant's average subjective level of sexual arousal was used as a manipulation check, to ensure that participants did not violate set cut-off levels. In an effort to mask the true purpose of the study, participants were also asked to rate their subjective levels of happiness, anger, and sadness; these measures were not used to determine cut-off levels.

Scenarios Sexual risk-taking and decision-making were assessed using a self-report questionnaire. Participants were asked to answer questions about their actions in different hypothetical scenarios. The questionnaire included a set of distracter items, which focused on behavior in non-sexual situations (e.g., "How likely are you to trust a stranger to watch over your laptop for you at a coffee shop?" or "How likely are you to copy answers from another student's paper during an exam?"); these items were included in an attempt to mask the true purpose of the experiment. Target items presented scenarios related to unsafe sexual activities. Typically, these items described a romantic scenario with a dilemma related to condom negotiation (e.g., "While fooling around with a woman/man after a few dates, you both decide to 'take it to the next level' and have sex. However, neither of you has a condom, and you know that the nearest pharmacy is closed. S/he tells you that it's okay because she is/you are on the pill and s/he doesn't sleep around." See "Appendix" for all items). Participants rated how likely they were to engage in a described behavior (e.g., "How likely are you to go ahead and have sex with your date without a condom?") using a Likert scale ranging from 1 (extremely unlikely) to 10 (extremely likely). This questionnaire was divided into four sections, with items pseudo-randomly assigned so that each section was comprised of two random distracter items and two random target items. The ordering of the items within each section was determined randomly by the computer program used, as was the presentation of each section, to prevent order effects.

Procedure

During the recruitment process, potential participants were invited to participate in a research project about gender differences in preferences for video clips. Although this was a deception, potential participants were informed that they may be exposed to sexual material. Because participants believed they were taking part in a study about their film clip preferences, they were told that the presented scenarios would be a side task, meant to fill time in between the video clips as well as to collect demographic information. Deception was used in this study in order to reduce expectancy effects potentially associated with the sexual arousal manipulations.

A gender-matched experimenter greeted participants and explained the experimental procedures. The entire task was administered via a computer. Participants engaged in either the experimental/sexual arousal condition and viewed the four sexually explicit videos or they engaged in the control condition and viewed the four non-sexual videos. The procedure was divided into four blocks of activity; each block consisted of watching 2 min of video, followed by the mini mood scale and a short section of the questionnaire described above. Each session was divided up into these four blocks in an effort to maintain a heightened state of sexual arousal in the experimental group through repeated exposure to the sexually explicit video material.

After the completion of all four blocks of activity, participants completed another manipulation check. Participants rated and ranked all four videos clips in a number of categories, including "entertaining," "boring," and "sexually arousing"; this check also fit well with the cover story about the examination of gender differences in film clip preferences. After completing the video clip rankings, participants were asked to respond to items collecting demographic information (age, relationship status, recent sexual behavior, etc.). Following the completion of this final survey, participants played an online educational trivia game on STIs and safer-sex practices (*Adventures in Sex City*) (Middlesex-London Health Unit, 2007) to provide a cooling period before debriefing began. The purpose of the cooling period was to allow for any feelings of sexual arousal in the experimental condition to dissipate, as well as to educate participants in both conditions about safer-sex

practices, thus increasing the personal benefit of participating in this study. At study completion, a same-gendered experimenter completed a thorough debriefing and obtained fully informed consent for data inclusion. Participants spent, on average, 35–45 min completing this experiment, and, in return for their participation, students received a course credit for any eligible psychology class.

Results

Arousal Manipulation Check

Using Hotelling's Trace, it was found that there was a significant effect of condition on participant mood, $V = .327$, $F(4, 122) = 9.98$, $p < .05$. However, separate univariate ANOVAs on the outcome variables revealed that the only variable that showed a significant effect of condition was Sexual Arousal, $F(1, 125) = 35.55$, $p < .05$, such that participants in the experimental condition ($M = 4.10$, $SD = 2.00$) were significantly more sexually aroused than participants in the control condition ($M = 2.30$, $SD = 1.40$). All cases were included in this analysis, and the average of the individual mood scores for all four video clips was used. However, as mentioned previously, 29 participants exceeded (control condition) or failed to reach (experimental condition) the sexual arousal cut-off score associated with their condition and were subsequently removed from further analyses.[2] Similarly, among our final sample, significantly higher levels of sexual arousal were demonstrated by participants in the experimental condition ($M = 5.13$, $SD = 1.35$) than participants in the control condition ($M = 1.84$, $SD = .89$), $t(111) = 15.6$, $p < .01$.

In the full sample (i.e., before cases were eliminated for violating cut-off criteria), a significant gender difference in sexual arousal was found. Male participants in the experimental condition were significantly more sexually aroused by the videos ($M = 5.33$, $SE = 0.34$) than female participants ($M = 4.19$ $SE = 0.27$), $t(55) = -2.49$, $p = .016$. In the final sample, the significant gender difference persisted, such that male participants ($M = 5.75$, $SD = 1.13$) were significantly more aroused than female participants ($M = 4.79$, $SD = 1.35$) by the sexually explicit stimuli, $t(51.8) = 2.33$, $p = .02$, $d = .68$.

Sexual Decision-Making

Scale Validity A principal component analysis (PCA) was conducted on the 16 total items in the decision-making scale to ensure that the sexual decision items used in the questionnaire were correlated. The Kaiser–Meyer–Olkin measure (.72) verified sampling adequacy for the analysis (Field, 2009). Bartlett's test of sphericity indicated that correlations between items were sufficiently large for PCA, $\chi^2(120) = 488.69$, $p < .001$. The PCA revealed that all the questionnaire items related to sexual decision-making loaded well onto a single factor. The eigenvalue (λ) of this first principal component ($\lambda_1 = 4.08$) was almost three times larger than the eigenvalue of the next largest component ($\lambda_2 = 1.70$). All of the items related to sexual decision-making showed strong positive loadings on this principal component. The average calculated item communality for these eight items was 0.65 and this factor accounted for 29 % of the variance. A Cronbach's alpha value of .82 indicated good internal reliability (Field, 2009). The scores of the items relating to sexual decision-making were aggregated (averaged) into a general measure of sexual decision-making/sexual risk-taking behavior for further analyses. Levene's test of homogeneity of variance was significant, $F(3, 109) = 4.34$, $p < .01$; however, this issue was repaired using a squared transformation of the data.

Condition and Gender Effects

A 2 (Gender) × 2 (Condition: Sexual Arousal vs. Control) ANOVA revealed a significant main effect of gender, $F(1, 109) = 99.48$, $p < .01$, $d = 2.14$, such that male participants ($M = 6.25$, $SD = .75$) had stronger intentions to engage in unsafe hypothetical sexual behavior than female participants ($M = 3.01$, $SD = 1.64$). A significant effect of Condition was also found, $F(1, 109) = 5.13$, $p < .05$, $d = .52$, such that participants in the sexual arousal condition ($M = 4.52$, $SD = 1.88$) had stronger intentions to engage in unsafe hypothetical sexual behavior than participants in the control condition ($M = 3.50$, $SD = 1.99$).

A partial correlation showed a positive relationship between sexual arousal and risky intentions, controlling for gender: $r(110) = .32$, $p = .01$. Controlling for gender, it was found that as sexual arousal increased, intentions for risky sexual behavior also increased.

Discussion

The results of Experiment 1 suggest that sexual arousal may indeed have a similar effect on women as on men, once they are similarly sexually aroused. Members of both genders may be more willing to engage in potentially risky sexual behavior (i.e., having unprotected sex with a new or casual partner whose STI/HIV status is unknown) when sexually aroused than otherwise, and this finding lends credence to the concept of sexual myopia (Ditto et al., 2006). This could potentially lead to situations where a sexually aroused woman or man may be less likely to initiate condom negotiation or to respond appropriately when faced with an oppositional partner. Building on these results, Experiment 2 sought to assess the scope of sexual arousal's impact on risk-taking in general.

[2] Outcome analyses were also conducted using the full sample that did not exclude participants based on sexual arousal cut-off scores. As would be expected, results were weaker, with means trending in the anticipated direction but failing to reach significance.

Experiment 2: General Risk-Taking

Method

Participants

A sample of 122 heterosexual, sexually experienced undergraduate students who had not taken part in Experiment 1 was recruited to participate in Experiment 2 using the university psychology participant pool. The same cut-off level of self-reported sexual arousal was used as in Experiment 1. Based on this criterion, 30 participants were excluded—5 women and 1 man from the experimental condition and 10 women and 4 men from the control condition. The data from 102 participants were used: 68 women and 34 men. Demographic data indicated that eliminated participants did not differ significantly from included participants. Fifty-one participants took part in the experimental condition (sexual arousal) and 51 participated in the non-sexual control condition.

Participants ranged in age from 18 to 52 years (*M*: 24 years of age). Thirty-two percent of participants indicated that they were involved in a monogamous relationship while 50 % (combined) indicated they were single or in a casual relationship. Fifty-one percent of participants reported having had sex in the past 7 days and 60 % reported that they had not used a condom the last time they had sex. Forty percent of participants (combined) reported that they typically used condoms "rarely" or "never," while only 25 % reported using them "every time." The mean number of reported lifetime sex partners was 7.4 ($SE = 1.07$).

Measures

The same video clips and mini mood scale employed in Experiment 1 were used in Experiment 2. General risk-taking was assessed in the form of a modified, computer based, version of the card game Blackjack. The goal of the Blackjack game was to "win" against the computer as many times as possible by achieving a score as close to 21 as possible without exceeding a score of 21. Participants did not have the opportunity to win money, but were encouraged to see how well they could do in the game, as a challenge. Participants were told that the Blackjack task would be a neutral task to be completed in between the presentation of the video clips in order to give them a break between video clips. This was a deception, but, as in Experiment 1, participants were informed in advance that they may be exposed to sexually explicit material during the experiment.

During the game, participants were dealt two cards by the computer and were instructed to choose whether they would "stay" (not draw another card) or "hit" (draw another card). Participants engaged in a brief tutorial with the experimenter present, to ensure that they understood the rules of the game before the experiment began. The tutorial demonstrated two practice hands of blackjack: one hand where it was obvious the best option was to "hit" and one hand where it was obvious that the best option was to "stay." This was done to ensure that even participants with no Blackjack experience would understand how to play and win at the game. If participants failed to win during the tutorial, the experimenter would discuss the outcome with the participant to ensure that they understood what should have been done to win that hand.

Each round of Blackjack during the experiment required participants to play 10 hands of cards against the computer. Participants, however, were not told that the cards dealt, as well as the outcome of all the hands in the game, were predetermined. Of the 10 hands played in every round of the game, in two hands, it was obvious that the best choice was to "stay" (point values of 18–20), and in another two hands, it was obvious that the best choice was to "hit" (point values of 10 or less). In the remaining six hands, the best option was not obvious (the total points added up to 15, 16, or 17). Participants' decisions in these ambiguous rounds were where their risk-taking behavior was examined. Choosing to "hit" when dealt an ambiguous hand of cards was considered to be more risky because participants ran a greater risk of exceeding a score of 21 and losing against the computer dealer (whose cards were not visible at the decision point). The proportion of times participants chose to "hit" rather than "stay" on an ambiguous hand of Blackjack was taken as the dependent measure of risk-taking (similar tasks have been use in the past to assess risk-taking (e.g., see Baker & Maner, 2008; Galinsky, Gruenfeld, & Magee, 2003)).

Procedure

The procedure in Experiment 2 was identical to Experiment 1. However, the card game was substituted for the scenarios between the presentations of the video clips in four blocks of activity.

Results

Arousal Manipulation Check

Using Hotelling's Trace, it was found that there was a significant effect of condition on the mood of participants (the mood scale included "happy," "sexually aroused," "sad," and "angry"), $V = 1.80$, $F(4, 111) = 50.01$, $p < .05$. However, separate univariate ANOVAs on the outcome variables revealed that the only variable that showed a significant effect of condition was Sexual Arousal, $F(1, 114) = 130.85$, $p < .05$, such that participants in the experimental condition ($M = 5.15$, $SD = 1.75$) were significantly more sexually aroused by the sexually explicit videos they viewed than the control group was by the control video clips ($M = 2.00$, $SD = 1.03$). All cases were included in this analysis. A gender difference in sexual arousal was also present in the final sample; male participants in the experimental condition were significantly more sexually aroused by the videos ($M = 6.46$, $SE = 0.30$) than female participants ($M = 5.45$, $SE = 0.19$), $t(48) = -3.00$, $p = .004$.

Risk-Taking Analysis

The data were analyzed using a 2 (Gender) × 2 (Condition: Sexual Arousal vs. Control) ANOVA to compare the mean scores of males and females in the experimental and control groups. That is, the average percentage of risky plays (i.e., choosing to "hit" rather than "stay") that participants in these groups made on ambiguous hands during the game of Blackjack.

The main effect of gender was not significant; male participants ($M = .58, SD = .19$) were no more likely than female participants ($M = .60$, $SD = .17$) to make risky plays on ambiguous hands of Blackjack; $F(2, 97) = 0.27$, $p = .76$, 95 % CI $= -.06 \leq \mu_1 - \mu_2 \leq .09$. However, the main effect for Condition was significant, such that participants in the sexual arousal condition ($M = .63$, $SD = .17$) made risky plays on ambiguous hands of Blackjack significantly more frequently than participants in the non-sexual condition ($M = .56$, $SD = .18$; $F(1, 97) = 5.74$, $p < .05$, $d = 0.4$).[3]

A moderately significant positive correlation was found using a partial correlation between sexual arousal and risk-taking in the card game, controlling for gender: $r(99) = .164$, $p = .051$. Controlling for gender, as sexual arousal increased, participants engaged in more risky plays on ambiguous hands of Blackjack.

Discussion

As noted previously, Baker and Maner (2008) also used a modified version of the game Blackjack as a measure of risk-taking: they found heterosexual male participants displayed an increase in risk-taking after viewing attractive female faces. This was interpreted in terms of increased mating motivation, which promoted increased risk-taking among male participants only, due to a high degree of intrasexual competition. However, the results of the current study bring this hypothesis into question. We found no significant difference between the means of the men and women within either the control or the experimental groups in Experiment 2. This suggests that, contrary to Baker and Maner's assertions, women and men may be similarly incited to take more risks while highly sexually aroused. It may be that, similar to alcohol myopia, sexual myopia increases risk-taking in general among both men and women.

General Discussion

Previous research has established that sexual arousal may be an important contextual element in situations where new or casual heterosexual partners will have to make decisions about whether or not to engage in unprotected sexual activity (Norris et al., 2004). Studies that have examined some of the potential effects of sexual arousal on risk-taking and decision-making in the past may not have adequately empirically examined these effects in isolation, especially in women. This potential omission is particularly concerning because women play a major role in heterosexual condom negotiation (Harvey et al., 2006; Norris et al., 2004). Additionally, the scope of the effects of sexual arousal had not yet been made clear in the literature. The current study aimed to remedy these oversights by utilizing both male and female subjects and by investigating the scope of the potential effects of sexual arousal alone on sexual decision-making and on risk-taking in non-sexual situations.

The results of Experiment 1 appear to support the notion that men and women may *both* be vulnerable to the effects of strong sexual arousal when it comes to making decisions regarding sexual health behavior (as predicted by Lowenstein, 1996). Regardless of gender, sexually aroused participants displayed significantly greater intentions to engage in risky sexual behavior than control participants. Presumably, this was due to the myopic effects of sexual arousal—more attentional focus may have been placed on the goal of sexual gratification than on safer-sex practices (Ditto et al., 2006). It may be the case that sexually aroused individuals become more motivated to appraise themselves, their partner, and the current situation as posing low risk for STI transmission, and thus deem the use of a barrier, like a condom, to be less important.

Perhaps the current paradigm of placing women in the role of "gate-keepers" when it comes to sexual behavior is doing women and heterosexual dyads a disservice. The current results illustrate that women can also become more permissive when under the influence of sexual arousal: perhaps it is not right to expect more control from women when under the influence of sexual arousal than we do of their male partners. Sexual education programs may need to place more emphasis on the fact that *both* men and women can have difficulty making safer sexual decisions when they are sexually aroused and focus on the importance of *both* parties spending more time considering health and safety factors well in advance of sexual situations.

These findings are complemented by a study by Norris et al. (2009), showing that the effects of sexual arousal may vary over the course of a sexual encounter: women who become sexually aroused quickly may be less likely to insist that a condom be used later in the encounter. If this is commonly true, then both men and women need to begin condom negotiation very early on in a sexual encounter because waiting until they are in the midst of sexual activity will only make it more difficult to initiate condom negotiation.

In Experiment 1, male participants overall were also found to be more willing to engage in risky hypothetical sexual behavior than female participants. These results run contrary to the findings of Rotermann and McKay (2009), Saewyc, Taylor, Homma, and Ogilvie (2008), and Santelli, Sandfort, and Orr (2009), which suggested that women report using condoms less frequently than

[3] A linear regression analysis was also completed for both Experiment 1 and 2, using the full samples (pre-cut-off) to examine sexual arousal as a continuous measure. As expected, the results were weaker when the full sample was used. We chose to use condition as a dichotomizing variable, much like Huberman, Suschinsky, Lalumiere, and Chivers (2013) in order to examine a treatment effect.

men. However, in this study only *intentions* to use condoms in hypothetical situations were examined, not actual condom use; thus, these findings could be a reflection of, as Norris et al. (2004) asserted, women being in a more vulnerable position during sexual situations and having a greater intention than men to use condoms. Because men typically perceive themselves as being less vulnerable, this may have contributed to men appearing to be more willing in general to engage in risky hypothetical sexual behavior than women. However, in such a situation—where men appear to be more cavalier with their protective health behavior—who is really the more vulnerable population?[4] The difference seen in sexual risk-taking in Experiment 1 was quite dramatic: even male participants in the control condition were much more willing to engage in risky sexual behavior than the women in the experimental condition. This trends with previous findings suggesting that men (especially young men) are more prone to risk-taking when it comes to their health than women (Wilson, Daly, Gordon, & Pratt, 1996). Young men may require more extensive and/or tailored training in making safer sexual decisions than they currently receive in sexual education curriculums.

Additionally, this phenomenon may make condom negotiation in real-world situations even more difficult for women, as they may be more frequently forced to deal with an oppositional partner, who is less concerned about their own protection from STIs—a problem which may be exacerbated once either (or both) of the parties becomes highly sexually aroused. Condom use intentions have been found to correlate moderately to strongly with actual condom use (Sheeran, Abraham, & Orbell, 1999; Sheeran & Orbell, 1998; Turchik & Gidycz, 2012); thus, the difference in intentions incited by sexual arousal, as seen in this experiment suggests that sexual arousal's effects in situ, on actual condom use, may be very similar.

In Experiment 2, risk-taking was assessed in general, using a modified version of the card game Blackjack. Here it was found that both men and women seemed to display more risk-taking after becoming sexually aroused. The findings of Baker and Maner (2008), Ditto et al. (2006), and Metcalfe and Mischel (1999) help provide a possible hypothesis for why this occurred. First, viewing the sexually explicit videos was found to increase (most) participants' level of sexual arousal. In turn, this elevated level of sexual arousal may have resulted in some degree of sexual myopia in participants. Contrary to the postulations of Ditto et al. (2006) and Loewenstein (1996), increased sexual arousal may not exclusively impact risk-taking and decision-making within the sexuality modality. In Experiment 2, it was shown that participants in the experimental group displayed significantly more risk-taking in the card game than the control group—despite this game having nothing to do with attaining sexual gratification.

Sexual arousal's effect of increasing both general risk-taking behavior and intentions for risky sexual behavior, among both men and women could help explain the apparent disconnect between the attitudes/knowledge about safer-sex practices and actual safer-sex behavior among young adults. In a real life scenario, the visceral impact of engaging in flirting and/or pre-intercourse sexual play with a partner would likely be much stronger than viewing sexually explicit videos in a psychology research lab—thus, the effects of sexual arousal in a more natural setting might be amplified. This could result in an even greater willingness to partake in sexual activity with a casual or new partner, as well as a greater willingness to take part in such activity without using appropriate prophylactic protection, thus, increasing both parties' risk of contracting/transmitting an STI or HIV.

Limitations

No study is without limitations. One limitation in the current study involved the measure used to assess sexual arousal. While the mini mood scale does have face validity, the term "sexual arousal" may be interpreted differently by different participants and this could have affected participant responding. It may be that the participants in the control condition who exceeded the cut-off levels of sexual arousal did so because they interpreted the item differently than other participants. It may also be that these participants experience a higher baseline level of sexual arousal than may be typical. Further, it was noted that not every participant in the experimental condition reported sufficient levels of sexual arousal. Again, it is unknown whether participants who did not attain cut-off levels simply found the material unappealing or whether they were not attuned to any potential physiological experience of sexual arousal. There is a possibility that those participants who did attain cut-off sexual arousal levels were also similarly more likely to express greater intentions for sexual risk-taking.

Conclusion

Although sexual arousal appears to have no effect on knowledge of safer-sex practices (Ariely & Loewenstein, 2006), it may have an effect on the ability to assess risky situations and may change the perception of the advantages/disadvantages of practicing safer sex. Additionally, sexual arousal may have an impact on the successful initiation as well as the outcome of condom negotiation. A failure to appreciate such an effect of sexual arousal on our cognition and subsequent behavior could translate into a failure to avoid or to be prepared for such situations.

The findings of this study have implications for how safer-sex practices are taught in interventions and sexual education curriculums and may eventually translate into better preparedness in youth when approaching sexual situations. Educating individuals to become more aware of how easily their decision-making abilities could be affected in sexual situations will be the first step in helping them to overcome or account for the effects of sexual arousal. This may be done by training young people to prepare well in advance of sexual activity: ensuring that prophylactics

[4] However, it should be noted that, from a biological perspective, men are at a lower risk for contracting HIV and some STIs (e.g., gonorrhea and herpes) from heterosexual activity than women (Norris et al., 2004).

are easily accessible at all times and by training them to ensure that they discuss safer-sex practices with partners in advance, before their cognition is affected by sexual arousal. By understanding the antecedents and factors that lead to risky sexual behavior, we can start to develop more effective preventative measures for STI and HIV transmission among young adults. The current research offers a first step in better understanding these factors.

Appendix

See Table 1

Table 1 Risky Sexual Decision-Making Scale (Experiment 1)—used with a 10 point Likert scale (1 = not at all likely, 10 = extremely likely)

1. While fooling around with a woman/man after a few dates, you both decide to "take it to the next level" and have sex. However, neither of you has a condom, and you know that the nearest pharmacy is closed. S/he tells you that it's okay because she's/you are on the pill and s/he doesn't sleep around. How likely are you to go ahead and have sex with your date without a condom?
2. During sex with a woman/man you have just met on a blind date, you feel the condom you are using break, but s/he doesn't seem to notice. How likely are you to continue having sex without stopping to replace the broken condom?
3. An attractive woman/man at a dance club comes up to you and dances with you for a few songs. After a while s/he invites you to come home with her/him to have sex. Once there, you offer to use a condom but s/he refuses, saying that s/he prefers sex without a condom because it feels better. How likely are you to proceed without a condom?
4. A cute classmate comes over to work on a project, over the course of the night your flirting progresses to kissing which then progresses to groping and the removal of some clothing. You can tell that you two are going to end up having sex, but s/he hasn't brought up the issue of using a condom—how likely are you bring to it up?[a]
5. An attractive female/male friend of one your of your friends is visiting and you two seem to have a lot of sexual chemistry. You take her/him to your room where you begin to make out and fool around. S/he says s/he is very interested in having sex with you, but only if you have a condom—which you don't. How likely are you to try to convince this woman/man to have sex with you without using a condom?
6. How likely are you to trust an attractive woman/man you've just met who says s/he's STI/HIV free?[a]
7. How likely are you to use a condom if you didn't know the sexual history of a new sex partner?
8. How likely are you to use a condom, even if you were afraid that a woman/man might change her/his mind about having sex while you went to get it?

[a] Reverse scored

References

Abbey, A., Saenz, C., & Buck, P. O. (2005). The cumulative effects of acute alcohol consumption, individual differences and situational perceptions on sexual decision making. *Journal of Studies on Alcohol, 66*, 82–90.

Ariely, D., & Loewenstein, G. (2006). The heat of the moment: The effect of sexual arousal on sexual decision making. *Journal of Behavioral Decision Making, 19*, 87–98.

Baker, M. D., & Maner, J. K. (2008). Risk-taking as a situationally sensitive male mating strategy. *Evolution and Human Behavior, 29*, 391–395.

Blanton, H., & Gerrard, M. (1997). Effect of sexual motivation on men's risk perception for sexually transmitted disease: There must be 50 ways to justify a lover. *Health Psychology, 16*, 374–379.

Boldero, J., Moore, S., & Rosenthal, D. (1992). Intention, context, and safe sex: Australian adolescents' responses to AIDS. *Journal of Applied Social Psychology, 22*, 1374–1396.

Canin, L., Dolcini, M. M., & Adler, N. E. (1999). Barriers to and facilitators of HIV-STD behavior change: Intrapersonal and relationship-based factors. *Review of General Psychology, 3*, 338–371.

Chivers, M. L., Seto, M. C., & Blanchard, R. (2007). Gender and sexual orientation differences in sexual response to sexual activities versus gender of actors in sexual films. *Journal of Personality and Social Psychology, 93*, 1108–1121.

Chivers, M. L., Seto, M. C., Lalumiere, M. L., Laan, E., & Grimbos, T. (2010). Agreement of genital and subjective measures of sexual arousal in men and women: A meta-analysis. *Archives of Sexual Behavior, 39*, 5–56.

Ditto, P. H., Pizarro, D. A., Epstien, E. B., Jacobson, J. A., & Macdonald, T. K. (2006). Visceral influences on risk-taking behavior. *Journal of Bahvioral Decision Making, 19*, 99–113.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage Publications.

Galinsky, A. D., Gruenfeld, D. H., & Magee, J. C. (2003). From power to action. *Journal of Personality and Social Psychology, 85*, 453–466.

George, W. H., Davis, K. C., Norris, J., Heiman, J. R., Stoner, S. A., Schacht, R. L., … Kajumulo, K. F. (2007). Indirect effects of acute alcohol intoxication on sexual risk-taking: The roles of subjective and physiological sexual arousal. *Archives of Sexual Behavior, 38*, 498–513.

Harvey, S. M., Beckman, L. J., Gerend, M. A., Bird, S. T., Posner, S., & Huszti, H. C. (2006). A conceptual model of women's condom use intentions: Integrating intrapersonal and relationship factors. *AIDS Care, 18*, 698–709.

Harvey, S. M., Thorburn Bird, S., Galavotti, C., Duncan, E. A. W., & Greenburg, D. (2002). Relationship power, sexual decision making and condom use among women at risk for HIV/STDs. *Women and Health, 36*, 69–82.

Huberman, J., Suschinsky, K. D., Lalumière, M. L., & Chivers, M. L. (2013). Relationship between impression management and three measures of women's self-reported sexual arousal. *Canadian Journal of Behavioural Science, 45*, 259–273.

Loewenstein, G. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes, 65*, 272–292.

MacDonald, T. K., & Hynie, M. (2008). Ambivalence and unprotected sex: Failure to predict sexual activity and decreased condom use. *Journal of Applied Social Psychology, 38*, 1092–1107.

Mayer, J. D., & Gaschke, Y. N. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology, 55*, 102–111.

Metcalfe, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review, 106*, 3–19.

Middlesex-London Health Unit. (2007). *Adventures in sex cty*. Retrieved from http://www.healthunit.com/article.aspx?ID=15160.

Morris, J., & Stanton, A. (2008). *WALL-E* (motion picture). United States: Walt Disney Pictures.

Norris, J., Masters, N. T., & Zawacki, T. (2004). Cognitive mediation of women's sexual decision making: The influence of alcohol, contextual factors, and background variables. *Annual Review of Sex Research, 15*, 258–296.

Norris, J., Stoner, S. A., Hessler, D. M., Zawacki, T., Davis, K. C., George, W. H., … Abdallah, D. A. (2009). Influences of sexual sensation seeking, alcohol consumptions, and sexual arousal on women's behavioral intentions related to having unprotected sex. *Psychology of Addictive Behaviors, 23*, 14–22.

Patel, V. L., Gutnik, L. A., Yoskowitz, N. A., O'Sullivan, L. F., & Kaufman, D. R. (2006). Patterns for reasoning and decision making about condom use my urban college students. *AIDS Care, 18*, 918–930.

Prause, N., Staley, C., & Finn, P. (2011). The effects of acute ethanol consumptions on sexual response and sexual risk-taking intent. *Archives of Sexual Behaviour, 40*, 373–384.

Rotermann, M., & McKay, A. (2009). Condom use at last sexual intercourse among unmarried, not living common-law 20- to 34-year-old Canadian young adults. *Canadian Journal of Human Sexuality, 13*, 75–87.

Royalle, C. (2007). *Under the covers* (Motion Picture). United States: Adam & Eve Productions.

Saewyc, E. M., Taylor, D., Homma, Y., & Ogilvie, G. (2008). Trends in sexual health and risk behaviours among adolescent students in British Columbia. *Canadian Journal of Human Sexuality, 17*, 1–13.

Santelli, J., Sandfort, T. G., & Orr, M. (2009). U.S./European differences in condom use. *Journal of Adolescent Health, 44*, 306. doi:10.1016/j.jadohealth.2008.12.017.

Sheeran, P., Abraham, C., & Orbell, S. (1999). Psychosocial correlates of heterosexual condom use: A meta-analysis. *Psychological Bulletin, 125*, 90–132.

Sheeran, P., & Orbell, S. (1998). Do intentions predict condom use? Meta-analysis and examination of six moderator variables. *Journal of Social Psychology, 37*, 231–250.

Skakoon-Sparling, S., & Cramer, K. (2014). Paratelic/telic state, sexual arousal, and sexual risk-taking in university students. *Journal of Motivation, Emotion, and Personality, 2*, 32–37.

Steele, C. M., & Josephs, R. A. (1990). Alcohol myopia: Its prized and dangerous effects. *American Psychologist, 45*, 921–933.

Strong, D. A., Bancroft, J., Carnes, L. A., Davis, L. A., & Kennedy, J. (2005). The impact of sexual arousal on sexual risk-taking: A qualitative study. *Journal of Sex Research, 42*, 185–191.

Suschinsky, K. D., Lalumière, M. L., & Chivers, M. L. (2009). Sex differences in patterns of genital sexual arousal: Measurement artefacts or true phenomena? *Archives of Sexual Behaviour, 38*, 559–573.

Suvivuo, P., Tossavainen, K., & Kontula, O. (2009). Contraceptive use and non-use among teenage girls in a sexually motivated situation. *Sex Education, 9*, 355–369.

Troth, A., & Peterson, C. C. (2000). Factors predicting safe-sex talk and condom use in early sexual relationships. *Health Communication, 12*, 195–218.

Turchik, J. A., & Gidycz, C. A. (2012). Exploring the intention-behavior relationship in the prediction of sexual risk behavior: Can it be strengthened? *Journal of Sex Research, 49*, 50–60.

Wilson, M., Daly, M., Gordon, S., & Pratt, A. (1996). Sex differences in valuation of the environment? *Population and Environment, 18*, 143–159.