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ORIGINAL PAPER

Does Drinking Improve the Quality of Sexual Experience?: Sex-Specific Alcohol Expectancies and Subjective Experience on Drinking Versus Sober Sexual Occasions

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Abstract The present study compared the self-reported quality of emotional experiences on sexual occasions that differed in levels of alcohol consumption to determine whether widely held beliefs about alcohol's positive effects on sex are borne out in people's everyday sexual experience. Multilevel models were estimated using data from 7442 discrete sexual events collected over a 10+ year period from a community sample of 1946 Black and White young adults. Tests of between-person differences revealed that beliefs that drinking both enhances and disinhibits sexual experience are widely endorsed, and that those who hold strong expectancies for enhancement drink significantly more on sexual occasions than those who do not. Nevertheless, tests of within-person differences revealed that people's sexual experiences were generally less positive on drinking than sober occasions, even after controlling for a host of individual difference and event-level characteristics. Moreover, cross-level expectancy × alcohol interaction tests showed that even those who strongly endorsed alcohol's positive effects failed to report more positive sexual experiences on drinking versus sober occasions, with a single exception: Those with strong expectancies for sexual enhancement reported greater arousal at high consumption levels, whereas those with weak enhancement expectancies reported lower arousal. In short, drinking on sexual occasions failed to deliver any benefit for the majority of individuals across the majority of outcomes. Why positive beliefs are maintained in the face of largely contradictory experience, and how this information can be used to inform intervention and prevention is explored.

Keywords Alcohol-related sex expectancies · Alcohol use · Sexual experience · Event-level analyses · Within-person analyses

Introduction

In general, people believe that alcohol has strong positive effects on sexual behavior and feelings ([1–3], for reviews). Chief among these beliefs are the dual notions that sex is more enjoyable, satisfying, or exciting following consumption of alcohol, and that one's sexual behavior is disinhibited or "freed up" under alcohol's influence. A third belief—closely related to beliefs about disinhibition—is that drinking promotes riskier sexual behavior. Despite widely held beliefs about the generally salutary effects of drinking on sexual experience, little is known about how drinking actually affects the quality of everyday sexual experience, and whether these effects are consonant with widely held beliefs, either on average or for those individuals who subscribe to these beliefs. The present study therefore used event-level, within-person data to examine key propositions about the effects of individually held sex-specific alcohol expectancies on drinking in sexual situations, as well as the independent and joint effects of expectancies and self-reported alcohol consumption on the quality of sexual experience.

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Effects of Sex-Specific Expectancies on Drinking in Sexual Situations

Past research (reviewed below) provides consistent evidence that expectancies for sexual enhancement promote drinking in sexual situations, presumably in a bid to experience the expected benefits of drinking on sexual experience. In perhaps the first study to examine this issue, Leigh [2] found that a broad composite of sex-specific expectancies, including expectancies for enhanced sexual experience, was significantly and positively associated with amount consumed on the most recent sex occasion in a sample of San Francisco Bay area men and women. Expectancies also predicted a higher proportion of drinking (vs. non-drinking) sexual occasions in the past 30 days, though this effect was significant only among men.

Subsequent studies have replicated and extended these findings. For example, Dermen and Cooper [4] showed that sexual enhancement expectancies positively predicted drinking in sexual situations (i.e., before or during intercourse) over the past 30 days in a community sample of 874 randomly selected, sexually experienced adolescents (aged 13–19 years old). Hendershot and colleagues [5] replicated this association in a sample of young adults (aged 21–35), as did Kalichman and colleagues in three different samples—among high-risk individuals seeking services at STI clinics in Milwaukee, WI [6] and Cape Town, South Africa [7], as well as among gay and bisexual men [8]. Finally, two studies replicated this finding longitudinally. Kalichman and Cain [9], in a sample that partially overlapped their Milwaukee sample [6], showed that expectancies for enhanced sexual experience prospectively predicted alcohol use in sexual contexts over a 6-month period. In contrast, however, White and colleagues [10] observed concurrent associations between initial levels of enhancement expectancies and the frequency of drinking in sexual situations, but initial expectancies did not predict change over time in rates of drinking with sex.

Thus, despite some inconsistency in the longitudinal findings, evidence from multiple studies using different samples and methodologies indicates that individuals who believe that alcohol enhances sexual experience are indeed more likely to drink in sexual situations. Fewer studies have examined the effects of other expectancies, however, and their results are less straightforward. Dermen and Cooper [4], for example, found that expectancies for increased risk-taking predicted a lower probability of consuming any alcohol in sexual situations, a finding that is consistent with past research on the effects of general (as opposed to sex-specific) expectancies for negative effects (e.g., behavioral or cognitive impairment; see [11] for a review). Interestingly, however, disinhibition expectancies positively predicted drinking to intoxication among those who consumed any alcohol in the Dermen and Cooper study. In contrast, Leigh [2] observed a pattern of prediction in which expectancies for increased risk positively predicted the frequency of any drinking in sexual situations as well as the amount consumed at last sex.

Effects of Acute Alcohol Consumption and Sex-Specific Expectancies on the Quality of Sexual Experience

The literature on the effects of acute alcohol consumption and sex-specific expectancies on sexual experience is vast and complex (for reviews, see [3, 12–17]). The majority of this work, however, is only indirectly relevant to the present study given that most of these studies either focused on risky sexual behavior, or used an experimental design in a highly controlled laboratory setting—findings which might not generalize to subjective aspects of sexual experience in naturalistic settings. In addition, although hundreds of correlational studies show that usual patterns of alcohol use are strongly associated with typical or usual sexual experience (so-called global association studies; [18]), these studies are also deemed uninformative given that such designs cannot guarantee that drinking and sex co-occurred on the same occasion, which is a necessary though not sufficient condition for attributing causality to acute alcohol intoxication [12]. For these reasons, we focus on the handful of non-experimental, event-level or diary studies that examined alcohol effects on subjective sexual experience.

In the first such study, 69 sexually active, university-affiliated women (aged 18–34 years) recorded their alcohol and sexual experiences every day over a 3-month period [19]. Despite the fact that women in this study endorsed the belief that alcohol enhances sexual experience, no association between alcohol use and arousal, desire or sexual pleasure was found.

Using event-level data from the previously described survey of Bay area residents, Leigh [2] likewise obtained counterintuitive results. Again, despite findings that respondents believed that alcohol enhances sexual experience, that these beliefs positively predicted alcohol use at last intercourse, and indeed, were modestly positively correlated with self-reported enjoyment at last intercourse, beliefs were completely at odds with the observed effects of self-reported alcohol consumption. Both a dichotomous indicator of any alcohol use and self-rated degree of intoxication at last sex were significantly and negatively associated with enjoyment on that occasion, even after controlling for expectancy effects and usual consumption (partial $rs = -.10$ and $-.16$, respectively, $ps < .01$).

In contrast to these findings, however, a recent study obtained evidence of a salutary effect on subjective sexual

experience. Using data from 218 first-year college students who completed diaries over a 14-day period, Patrick and Maggs [20] found that students reported significantly more positive consequences (e.g., felt attractive, felt closer to partner) after sex on days when alcohol was consumed prior to sex compared with days when it was not consumed. Of note, however, drinking actually preceded sex on only 37 out of 2879 study days, raising questions about the replicability of this finding (see [21], for evidence that small n's increase *both* Type I and Type II error rates).

Results from a diary study conducted among 97 Finnish women, aged 18–35 years [22], further underscore the complex nature of alcohol effects on subjective sexual response. Analysis of diary reports completed every day across one menstrual cycle showed that both sexual interest and sexual desire were elevated on occasions when alcohol was consumed, but only during the post- and inter-menstrual phases of the cycle—a finding the authors attributed to alcohol-induced elevations in testosterone thought to occur during these phases. Also of note, calculation of within-person associations between alcohol, on the one hand, and sexual arousal and desire, on the other, revealed positive associations among only 1/4 of the women, suggesting that the majority of women experienced either no association or a negative one. Thus, the observed effect was highly circumscribed, occurring only during certain cycle phases, and only among a minority of women.

Finally, the previously discussed study by Patrick and Maggs [20] is the only naturalistic study we found that tested the interaction of sex-specific expectancies and alcohol use on the qualitative aspects of sexual experience. Their results revealed a single, marginally significant interaction between a composite measure of expectancies for increased sexual arousal, interest, and initiation and drinking prior to sex. Moreover, the interaction, when plotted, was counterintuitive.

The Present Study

Using event-level data on up to six sexual experiences from a large ($n = 1946$) and representative sample of Black and White adolescents who were followed over a 10+ year period into young adulthood, the present study examines three questions concerning the interplay of sex-specific alcohol expectancies, alcohol use, and subjective sexual experience.

First, we test the hypothesis that individuals who believe that alcohol enhances sexual experience will be more likely to drink on sexual occasions and will drink significantly more. We also examine the effects of expectancies for disinhibition and increased sexual risk on alcohol use in sexual situations, but do not offer specific hypotheses for these expectancies. Although expectancy theory supports the prediction that individuals who expect negative outcomes (such as disinhibited or risky behavior) should minimize or avoid drinking in circumstances where such outcomes are possible, the situation is complicated by the fact that disinhibited and even risky behavior are sometimes seen as positive outcomes [2]. This fact, along with sparse empirical evidence, make confident prediction for disinhibition and sex risk expectancies problematic.

Second, we examine the effects of drinking on the quality of self-reported sexual experience (indexed by feelings of love, arousal, and desire; emotional tone; perceived efficacy; and concern about possible positive and negative consequences) to determine whether these effects generally conform to widely held beliefs about alcohol's salutary effects on sexual experience. Given the small number of relevant non-experimental studies and the mixed nature of findings from these studies, specific hypotheses about the nature of these effects are not offered.

And finally, we test the hypothesis that individuals who believe that alcohol enhances or disinhibits sexual experience are more likely to find sexual experiences pleasant and rewarding when they are drinking than when they are sober. Expectancy theory clearly supports this prediction, and findings consistent with this expectation have been observed in controlled laboratory settings (e.g., [3, 23]). Thus, despite the lack of conceptual and empirical clarity regarding the nature of alcohol-fueled sexual experience on average, we hypothesize that alcohol consumption and relevant expectancies should interact to shape post-drinking sexual experience in a manner consistent with the content of the individual's beliefs.

Methods

Sample

The present study includes data from the first three waves of a longitudinal study of adolescents 13–19 years of age at Wave 1 (W1; conducted between 1989 and 1991) who were interviewed up to five times over more than a decade (range 11.2–15.0 years; see [24] and [25] for additional detail on the study design). At W1, participants were identified through a random-digit dial procedure that oversampled telephone exchanges in predominantly Black neighborhoods. Selected numbers were then screened to identify households including adolescents between the ages of 13 and 19 years, and a random selection table was used to select a single adolescent in households with more than one adolescent. Eighty-two percent of eligible participants ($n = 2051$) completed the interview at W1. A comparison of respondents and non-respondents (using data obtained during the initial screening call) showed no differences in race

or age, but female adolescents (83 vs. 79 %, $\chi^2 = 5.8$, $p = .016$) and those with better educated parents (13.1 vs. 12.8 yrs. education, $t[2080] = 2.1$, $p = .040$) were more likely to participate. In 1994–1995, 88 % of the initial cohort ($n = 1{,}813$) was interviewed a second time (W2), and about 6 years after that, 73 % ($n = 1{,}488$) of the initial cohort was interviewed a third time (W3). Data from Waves 4 and 5 are not included because complete information on sexual encounters was not obtained at either wave.

Attrition analyses revealed demographic differences in retention across waves. Results showed that respondents who were younger ($b = -.026$, $t[1992] = -3.8$, $p < .001$), White ($b = .067$, $t[1992] = 2.4$, $p = .017$), and female ($b = .292$, $t[1992] = 10.6$, $p < .001$), as well as those from higher socioeconomic status (SES) backgrounds ($b = .045$, $t[1992] = 2.6$, $p = .010$) completed more interviews. With the exception of gender, however, these effects were small in magnitude. In short, although retention rates were generally excellent and there was little systematic race, SES, or age bias, the final sample is likely to be more representative of female than male participants due to their higher rates of initial participation as well as higher rates of retention across waves.

Data for the present study were provided by a subset of 1946 individuals (95 % of the initially interviewed sample). Excluded individuals included W1 or W2 virgins who were lost to follow-up ($n = 63$); those who were still virgins at W3 ($n = 28$); and those who provided no valid event reports ($n = 11$) or reported on only same-sex events ($n = 3$). Excluded respondents compared with included respondents were younger at W1 (15.6 vs. 16.3 years), $t(2049) = -3.3$, $p < .001$, and more likely to be White (71 vs. 55 % non-White), $\chi^2(1) = 9.3$, $p = .002$. However, there were no gender or SES differences between those who were dropped ($n = 105$) versus retained ($n = 1946$). The final, retained sample was 46 % male and 47 % Black, with an average of 13.1 years of education, and an average age (across all sexual events) of 21.3 years.

Interview Procedures

At W1, informed consent was obtained from participants prior to the interview, as was parental consent for minors. A structured face-to-face interview was conducted in private interview rooms on the campus of the State University of New York in Buffalo by a professionally trained interviewer who was always matched on gender and, in 75 % of the cases, on race as well. However, both the expectancy measures and sexual event reports were obtained using a pen-and-paper questionnaire, which was completed while the interviewer remained in the room seated at a discrete distance. Respondents sealed the completed questionnaire in a privacy envelope at the end of the interview.

An identical procedure was followed at W2 and W3 with two exceptions. First, both the interviewer- and self-administered portions of the interviews were administered on a laptop computer. Second, at W2 and W3, 5 % ($n = 90$) and 24 % ($n = 373$), respectively, of participants who had moved out of the area were interviewed by phone. Comparison of key sexual behavior and alcohol use items assessed in phone versus face-to-face interviews revealed no differences after controlling for demographic differences between individuals who moved versus stayed in the local community (see [26], for details).

Event-Level Data

At each wave, respondents were asked a series of questions regarding the most recent (or last) time they had sex, followed by a parallel series of questions about the first time they had sex with that particular partner. If the most recent experience was a first-time sexual experience, then no further event reports were obtained at that wave. The number of waves for which each person provided sexual event reports also depended on attrition and age of sexual debut. Accordingly, respondents provided from one ($n = 160$; 8 %) to six ($n = 510$; 26 %) non-overlapping sexual event reports for a total of 7,588 event reports ($M = 3.9$ events per person). To ensure that we examined consensual events only, event reports involving physical coercion ($n = 61$) were dropped. Event reports involving a same-sex partner ($n = 80$) were also dropped given that there were too few to analyze separately and preliminary analyses suggested differences in subjective experience across same- and opposite-sex events. Finally, events were also dropped if the respondent was younger than 10 years old at the time of sex ($n = 5$). After exclusions, analyses were based on a maximum N of 7,442 event reports.

Measures

Expectancies for Alcohol's Effects on Sexual Experience

A total of 13 items developed by Dermen and Cooper [1] were used to measure each of three alcohol-related sexual expectancies: enhancement, disinhibition, and increased risk-taking. Respondents read the following instructional set: "Many people believe that alcohol can influence how they feel and act sexually. We would like to know how you think having a few drinks of alcohol affects your sexual feelings and behavior." The set of items was directly preceded by the stem, "After a few drinks of alcohol,…." Representative items included: "I feel closer to a sexual partner," and "I am a better lover" (Enhancement); "I am more likely to do sexual things that I wouldn't do when sober," and "I am more likely to have sex with someone I

wouldn't have sex with when sober." (Disinhibition); and "I am less likely to take precautions before having sex," and "I am less likely to talk with a new sexual partner about whether he [she] has a sexually transmitted disease, like AIDS or gonorrhea." (Increased Risk-Taking). Agreement with each item was rated on a scale ranging from strongly disagree (1) to strongly agree (6).

Each sub-scale was measured at all three waves. Coefficient alphas (calculated at each wave) ranged from .83 to .90 for enhancement, .70 to .87 for disinhibition, and .79 to .89 for increased risk-taking. Expectancy measures were moderately stable across time (mean r across waves = .35 for enhancement, .47 for disinhibition, and .36 for increased risk), despite 5+ year intervals between waves. Accordingly, an average across waves was computed for each expectancy scale, on the assumption that the averaged (across time) value provides the single best representation of an individual's stable and enduring beliefs about alcohol's effects on sexual behavior. Finally, due to their high inter-correlation (r = .73), the disinhibition and increased risk composites were averaged to form a single disinhibition/increased risk expectancy measure for use in our primary analyses. This composite was correlated .51 with enhancement expectancies. Means for the two composites were 3.0 (±1.1) and 2.8 (±1.1) for enhancement and disinhibition/risk, respectively, on the 1–6 scale.

Event-Level Alcohol Use

Respondents were asked whether they had consumed any alcohol on each sexual occasion; if yes, they were asked to report how much they drank on a 1–3 scale, where 1 = 1–2 drinks, 2 = 3 or 4 drinks, and 3 = 5 or more drinks. Standard drink equivalents were defined beforehand in order to facilitate consistent use of the response scale.

In-the-Moment Feelings and Perceptions

Seven inter-related aspects of sexual experience were assessed for each occasion: feelings of love, arousal, and emotional valence (positive vs. negative); self-efficacy; the degree to which sex was wanted; and perceived costs and perceived benefits of having sex on that occasion.

Arousal was measured by the mean of two items: "To what extent did you feel active, engaged, or aroused versus inactive, disengaged, or unaroused on that occasion?" and "To what extent did you feel interested and excited on that occasion?" Both items were rated on a 7-point scale where 1 indicated low and 7 = high arousal/interest. The average correlation between the two items was .60.

Feelings of love were measured in two different ways across waves. At W2 and W3, love was measured by a single item: "How much in love did you feel on that occasion?" Responses were provided on a 1–7 scale, where 1 = "Not at all" and 7 = "A great deal." At W1, love was measured by two items (the extent to which the respondent felt affection toward and cared for his/her partner). Items were rated on a 0–2 scale, where 0 = not at all and 2 = strong feelings of affection/caring. W1 items were recoded (viz., 0 = 1, 1 = 4, 2 = 7) to conform to the 7-point scale used at W2 and W3, and then averaged (r between the two W1 items = .39).

Emotional valence was also assessed in two different ways across waves. At W2 and W3, emotional valence was measured by a single item: "To what extent did you feel pleasant, positive, or good versus unpleasant, negative or bad on that occasion?" and was rated on a 7-point scale where 1 = "Extremely Negative" and 7 = "Extremely Positive." At baseline, respondents rated the extent to which they experienced each of 4 positive and 4 negative emotions on that occasion, where 0 = none of the particular emotion and 2 = strong levels of the emotion. Positive emotions included happy, proud, calm, and confident; negative emotions included scared, guilty, confused, and insecure. The sum of negative emotion ratings were then subtracted from the sum of positive emotion ratings, thus yielding an overall index of positive (vs. negative) emotional valence. Scores were then re-expressed to conform to the 1–7 scale used at W2 and W3.

Self-efficacy was measured by two items; "How certain were you that you could handle whatever happened in this sexual situation?" and "At that time, how well did you believe that you would be able to cope with whatever happened in this sexual situation?" Both items were rated on a 1–7 scale, where 1 = "Not at all" and 7 = "A great deal." The average within-occasion correlation between the two items was .70. These items were not included at the final wave, resulting in a smaller sample of individuals (n = 1820) and events (n = 4618) for the self-efficacy analyses.

The *extent to which sex was wanted* on each occasion was measured by the mean of two items: "How much did you want to have sex on that occasion?" and "To what extent was having sex with (Partner Name) consistent or inconsistent with what you wanted on that occasion?" Both items were rated on a 7-point Likert scale, where 1 = unwanted/inconsistent and 7 = wanted/consistent. The average r between the two items across all sexual events was .65. These items were not included at baseline, thus yielding a smaller sample of individuals (n = 1695) and events (n = 4716).

Perceived costs and benefits of having sex on each occasion were measured by 3 and 4 items, respectively. Both sets of items were preceded by the following question: "At the time, how likely did you think it was that you would have experienced (insert cost/benefit here) as a

result of having sex on that occasion?" All items were rated on a 7-point Likert scale, where 1 = "Not at all" and 7 = "A great deal." Perceived benefits included: "Some type of physical benefit (e.g., orgasm);" "Some type of personal benefit (e.g., enhanced self-esteem);" "Some type of relationship benefit (e.g., strengthen bond w/partner);" and "Some type of social benefit (e.g., enhanced reputation)." The average within-occasion correlation among the 4 items was .54. Perceived costs included: "Any type of personal cost (e.g., guilt, shame);" "Any type of relationship cost (e.g., unwanted expectations);" and "Any type of social cost (e.g., tarnished reputation)." The average within-occasion correlation among the three items was .35. Finally, these items were also not included at baseline, thus yielding a smaller sample of individuals ($n = 1704$) and events ($n = 4718$).

Overview of Data Analysis

A series of multilevel random coefficient (MRC) models was estimated using the Hierarchical Linear & Non-Linear Modeling program, Version 7.01 (HLM; [27]). The MRC model is well-suited to these data because multiple event reports (at Level 1 [L1]) can be nested under the individual (at Level 2 [L2]), thus taking dependencies in a person's reports of multiple events into account.

Two sets of MRC models were estimated. To test our first hypothesis about the effects of sex expectancies on drinking on sexual occasions, average levels of alcohol use collapsed across all sexual events (modeled at L1) were predicted from averaged (across waves) levels of sex-specific expectancies (modeled at L2). To test hypotheses about the effects of drinking on in-the-moment sexual experiences, associations between within-person changes in alcohol use and within-person changes in in-the-moment feelings across specific sexual occasions were estimated at L1. To examine the possibility that sex-specific expectancies moderate the effects of alcohol use on in-the-moment feelings, a final set of models was run testing cross-level interactions between alcohol use (modeled at L1) and between-person differences in averaged levels of sex-specific expectancies (modeled at L2). Race (Black vs. non-Black), gender, and parental SES (a standardized composite of the highest grade of education completed by either parent and employment status [0 = neither parent employed; 1 = either employed]) were controlled at L2. Age at time of the sexual event, relationship status rated on a 1–7 scale where 1 = "Someone you just met" and 7 = "Spouse," and type of sexual occasion (first-time sex event versus subsequent event with the same partner) were controlled at L1.

Several analytic decisions cut across all analyses and are thus discussed here. First, distributional properties of all outcomes were examined to ensure their normality. All variables had skew ≤ 2.0 and kurtosis ≤ 4.0. Because these values fall within an acceptable range [28], particularly for large samples, no transformations were undertaken. Second, all L1 variables were person-centered, which effectively controls for mean level differences within a person across occasions [29, 30], and ensures that coefficients are estimated at values that fall within the observed range of values (namely at the mean). Third, L2 variables were grand-mean centered (i.e., centered around the mean in the sample of individuals; [29, 30]). This too facilitates interpretation, just as it does in ordinary regression [31]. Fourth, to provide more stable estimates of significant effects, trimmed models were developed by dropping non-significant effects [32]. Fifth, EM estimation was used for continuous outcomes, whereas Bernoulli estimation with an overdispersion parameter was used for condom use. Finally, although all effects would be ideally estimated as random [29], problems with model convergence precluded this. Thus, following recommendations by Nezlek [29], effects were estimated as either fixed or random based on the significance (or lack thereof) of random error terms when estimated individually in a set of preliminary analyses.

Results

Descriptive Analyses of Event-Level Alcohol Use and In-the-Moment Feelings

Table 1 presents means for the event-level alcohol and subjective sexual experience variables, overall and broken down by first and last sex occasions. As shown, respondents drank on 19 % of sexual occasions, and the average amount consumed on drinking occasions was 1.87, or about 3 drinks. Individuals were significantly more likely to drink on first than last sex occasions and also reported drinking significantly larger quantities.

As shown in the second column of Table 1, overall means on all positively scored items (viz., all but perceived costs) were above the mid-point of their respective scales, whereas the mean for perceived costs was well below the mid-point of its scale, suggesting that adolescents and young adults experienced these sexual encounters as generally positive and rewarding. Comparing first sexual experiences with subsequent ones revealed that, in general, last sexual experiences (i.e., those with a partner with whom they had previously had sex) were more positive than first-sex experiences: Respondents reported feeling more confident and self-efficacious, more loving, affectionate, and caring, and more positive (vs. negative) emotions with an established versus first-time partner. In

Table 1 Descriptive statistics on primary alcohol and sexual experience event-level variables, broken down by first and last sex occasions

	Range	Overall	Mean (*SD*)		*d*	Signif. Test	*p* value
			First	Last			
Drank on occasion?	0–1	.19 (0.39)	.22 (0.41)	.14 (0.35)	.21	$\chi^2(1) = 66.6$	<.001
Amount consumed	1–3	1.87 (0.78)	1.92 (0.79)	1.76 (0.75)	.21	$t(1392) = 3.59$	<.001
Feelings of love	1–7	4.37 (2.14)	3.79 (2.06)	5.01 (2.06)	−.59	$t(6713) = -24.30$	<.001
Arousal	1–7	5.21 (1.78)	5.29 (1.75)	5.12 (1.81)	.10	$t(6661) = 3.84$	<.001
Emotional valence (positive vs. negative)	1–7	5.43 (1.33)	5.36 (1.34)	5.51 (1.31)	−.11	$t(6661) = -5.28$	<.001
Perceived self-efficacy	1–7	4.60 (1.43)	4.36 (1.33)	4.96 (1.49)	−.43	$t(4658) = -14.46$	<.001
Want sex/goal consistent	1–7	5.77 (1.33)	5.73 (1.34)	5.81 (1.33)	−.06	$t(4741) = -1.85$	.064
Perceived costs	1–7	2.08 (1.14)	2.63 (1.47)	1.71 (1.30)	.66	$t(4665) = 22.40$	<.001
Perceived benefits	1–7	4.17 (1.26)	4.09 (1.23)	4.25 (1.28)	−.13	$t(4665) = -4.25$	<.001

SD Standard deviation, *d* calculated by subtracting value for last sex from value for first sex, and dividing by the pooled *SD*. Whether alcohol was consumed on the occasion was coded 0 = no, 1 = yes. Values for first and last sexual experiences compared via *t* test for all outcomes, except for the dichotomous alcohol use outcome, which was compared via a χ^2 test. Values for quantity consumed were calculated and compared for drinking occasions only ($n = 1393$)

addition, having sex with an established partner was perceived as having more benefits and substantially fewer costs than having sex with a first-time partner. In the only exceptions to this pattern, sex was equally wanted on both types of occasions and arousal was actually higher on first-time occasions (though the effect was small). The overall pattern of results conforms closely to what common sense and past research tell us about the phenomenology of first-time sexual experiences, and thus lends support to the validity of the event-level subjective measures.

Do Expectancies Predict Drinking in Sexual Situations?

To test our first hypothesis, averaged (across sexual occasions) levels of alcohol use were examined as a function of between-person differences in expectancies. Effects for the two expectancy measures were simultaneously estimated, and controlled for the previously described covariates. The full sample of sexual events was used in the analysis predicting any use, whereas only the subset of drinking events was used in the analysis predicting quantity consumed. Results are summarized in Table 2.

As shown in Table 2, and consistent with both expectancy theory and past research, expectancies for enhanced sexual experience positively predicted the probability of drinking any alcohol, as well as the amount consumed on drinking events. Interestingly, however, expectancies for disinhibition/increased risk were differentially related to the two alcohol outcomes. Disinhibition/risk expectancies were unrelated to whether any alcohol was consumed, but significantly positively predicted amount consumed on drinking events.

How Does the Quality of Sexual Experience Differ on Drinking Versus Non-drinking Occasions?

To examine our second research question, we estimated the within-person associations between drinking on a sexual occasion and subjective experience on that occasion, as indexed by the previously described measures of in-the-moment feelings and perceptions. Results of these analyses are summarized in Table 3.

As shown in Table 3, individuals felt significantly lower levels of love,[1] perceived significantly more costs associated with having sex, and felt marginally less self-confident on drinking versus sober occasions. Moreover, all of these effects held even after controlling for age at the time of the event, partner intimacy, and event type (i.e., first vs. subsequent sex occasion). Finally, no differences were observed between individuals' experiences on drinking versus sober sexual occasions for emotional valence,[2] arousal, perceived benefits, or the extent to which sex was wanted. Thus, consistent with results from prior studies, drinking occasions were experienced as no different from

[1] Supplemental analyses were conducted to determine if similar results were obtained using W1 data vs. W2 and W3 data, given that feelings of love were measured differently at W1. Results showed that alcohol was negatively related to feelings of love in both subsets of data ($bs = -.122$ and $-.142$ for W1 and for W2 + W3, respectively). However, only the latter effect was significant at $p < .001$, owing at least in part to the larger number of events at W2 + W3 (4910 vs. 1796).

[2] Supplemental analyses were also conducted to determine if similar results were obtained for emotional valence using W1 vs. W2 + W3 data. Despite use of different measurement approaches, results showed that alcohol was unrelated to emotional valence in both subsets ($bs = -.028$ and $-.006$, respectively, *ns*).

Table 2 Summary of between-person expectancy effects on averaged event-level alcohol use

Expectancy	Any alcohol?			Quantity		
	$b \pm$ SE	*t* test	*p value*	$b \pm$ SE	*t* test	*p value*
Enhance	.499 ± .043	11.57	<.001	.106 ± .025	4.19	<.001
Disinhibit/Risk	−.016 ± .044	−.365	.715	.081 ± .026	3.07	.003

Any alcohol coded 0 = no, 1 = yes. b = unstandardized regression coefficient; SE = standard error of the b. Expectancy effects were estimated together in the same equation, and controlled for gender, race, and parental SES (modeled at L2) and age at time of event, type of event (first vs. last), and relationship with partner at time of event (modeled at L1). Analyses predicting any alcohol were estimated in the full sample of individuals/events; analyses for quantity were estimated for drinking events only (824 individuals, 1399 events)

Table 3 Summary of within-person alcohol effects on feelings in the moment

Feelings in the Moment	$b \pm$ SE	*t* test	*p value*
Feelings of love	−.120 ± .034	−3.48	.001
Arousal	.000 ± .027	.011	.991
Emotional valence (positive vs. negative)	−.017 ± .025	−.668	.504
Perceived self-efficacy	−.044 ± .025	−1.84	.070
Want sex/goal consistent	.013 ± .024	.527	.598
Perceived costs	.079 ± .026	3.03	.003
Perceived benefits	.022 ± .023	.971	.332

b = unstandardized regression coefficient; *SE* standard error of the b. Alcohol effects were estimated in an equation controlling for gender, race, parental SES, and both expectancy composites (modeled at L2), and for age at time of event, type of event (first vs. last), and relationship with partner at time of event (modeled at L1)

or, in several cases, more negative than sober occasions. Indeed, in no case were subjective reports of sexual experiences more positive on drinking than sober sexual occasions.

Do People Who Believe That Alcohol Enhances Sexual Experience Report More Positive Experiences on Drinking Than Sober Sexual Occasions?

The final series of analyses tested cross-level interactions between quantity consumed (with individuals who did not drink on the occasion receiving a 0) and expectancies (both enhancement and disinhibition/sex risk) on in-the-moment feelings and perceptions. Results (not tabled) revealed a single significant cross-level interaction of the 14 (2 expectancies × 7 outcomes) interactions tested. Specifically, enhancement expectancies moderated the within-person association between quantity consumed on sexual occasions and feelings of arousal on those occasions ($b = .051$, $t[6722] = 2.001$, $p = .045$). Plotting the interaction for individuals low (at the 20th percentile) and high (at the 80th percentile) on enhancement expectancies revealed an opposing effect of consumption on arousal. As shown in Fig. 1, and consistent with the notion that expectancy functions as a self-fulfilling prophecy, arousal increased with increasing consumption among those who believed that alcohol enhances sexual experience, but decreased among those who disavowed this belief.

Discussion

The present study compared subjective sexual experience on intoxicated versus sober occasions to determine whether widely held beliefs about alcohol's positive effects on sex are borne out in people's everyday sexual experience. Our findings support the following conclusions. First, individuals who believe that drinking enhances or disinhibits sexual behavior are indeed more likely to drink, and to drink more, in sexual situations, presumably in an effort to realize the sexual benefits that alcohol is assumed to confer. Second, intoxicated sexual events are, on average, experienced as similar to, or less positive than, sober ones. Indeed, adolescents and young adults in our sample reported feeling less love for their partner, less confidence in their ability to handle the sexual situation, and perceived more social, personal, and relationship costs on drinking than sober occasions, even after controlling for gender, race, age at time of the sexual event, type of sexual event, and the nature of the relationship with one's sexual partner on that occasion. Third, even those individuals with strong

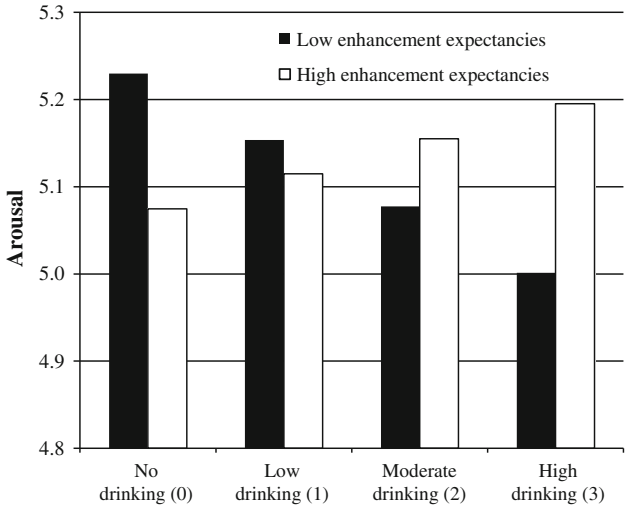

Fig. 1 Expectancies for sexual enhancement × Alcohol use predicting feelings of arousal during sex

positive expectancies for alcohol's effects on sexual experience failed to experience alcohol's reputed benefits, with a single exception: Individuals with strong expectancies for sexual enhancement reported more arousal on occasions when they drank or drank heavily compared with non-drinking or lighter drinking occasions, whereas individuals with weak expectancies reported less arousal on drinking versus sober occasions.

In short, although we must allow the possibility that alcohol facilitates arousal for individuals with high enhancement expectancies, the present study otherwise found no support for the widely held belief that alcohol enhances everyday sexual experience. Indeed, to the contrary, we found evidence that everyday sexual experiences that occur under the influence of alcohol are, on the whole, less rewarding and enjoyable than sober ones.

Theoretical and Practical Implications

These findings raise a number of theoretically and practically important questions. One such question concerns the apparent discrepancy between widely held beliefs about alcohol's positive effects on sexual experience and the negative or null effects observed in the present study. Indeed, where do positive beliefs come from if not from personal experience?

Clearly, media is one possible source of these beliefs. A recent meta-analysis [33] examining the effects of what the authors called "risk-glorifying" media content on corresponding risk beliefs and behaviors found a small to moderate overall effect of alcohol content on positive attitudes and beliefs toward alcohol ($g = .26$), and an even larger effect of sexual depictions in media on positive attitudes toward sex ($g = .45$). Moreover, several studies provide evidence that exposure to media content precedes and presumably *causes* corresponding belief formation and behavior (e.g., see [34], on alcohol content, and [35] on sexual content). Although fewer studies have examined the prevalence and nature of media depictions linking alcohol and sex, available research indicates that such depictions are common and overwhelmingly positive [36, 37], either implying or explicitly stating that alcohol acts as a sexual lubricant and increases sexual pleasure.

Thus, even though it seems likely that media is an important source of beliefs about alcohol's positive effects on sexual experience, this leaves open the question of how positive beliefs are maintained in the face of largely contradictory personal experience. A careful analysis of the evidence, however, suggests a number of reasons why these beliefs might persist. First, in contrast to media images which are purposively designed to be salient and impactful, actual effects are likely to be subtle. Not only were the majority of tested effects in the present study null, even the significant effects were small in magnitude. Indeed, the largest standardized beta weights corresponding to the effects reported in Table 3 were <.10. Thus, even when negative effects do occur, they might be imperceptible to the individual, or wrongly attributed to other features of the occasion. Furthermore, beliefs about the effects of alcohol on sexual experience, though positive on the whole, are not universally positive. In fact, it is widely understood that drinking too much can dull the senses and impair performance, particularly among men (to wit, the oft referenced Shakespearian quote that, "drinking provokes the desire but takes away the performance"). Thus, in situations where negative and positive beliefs exist alongside one another, a correctly attributed alcohol-related negative experience would not necessarily be expected to challenge an individual's overall belief structure.

Finally, our data indicate that individuals who hold strong positive beliefs about alcohol's enhancement effects may in fact experience greater arousal on drinking versus sober occasions, which in turn should work to reinforce and maintain positive beliefs. Effects on arousal might also be more highly prized than other effects on subjective experience. Consequently, positive effects on arousal could outweigh or "swamp" the effects of negative alcohol-related experiences on the content of individually held expectancies. Thus for all of these reasons, beliefs that alcohol positively impacts sexual experiences might not be easily challenged or disconfirmed, even in the face of largely countervailing experience.

The present findings also hold promise in terms of designing effective prevention and intervention strategies aimed at reducing alcohol use in sexual situations.

Psychoeducational approaches designed to deliver accurate information on the observed effects of alcohol on the quality of sexual experience represent one relatively straightforward, low cost approach [38]. Interventions modeled on the expectancy challenge protocol [39] offer a related, but more intensive approach in which participants interact with one another while drinking in a laboratory bar setting. Participants are randomly assigned to drink alcohol or receive a placebo, while non-drinking participants passively observe. At the end of the session, participants guess who consumed alcohol versus a placebo, and are then told the truth. Participants typically guess at chance levels which sets the stage for a meaningful dialogue about the power of expectancies to shape alcohol-related consequences. Evaluations of expectancy challenge interventions indicate that this approach reduces endorsement of positive alcohol expectancies and alcohol consumption up to 6 weeks later [39, 40], and moreover that changes in expectancies mediate intervention effects on consumption [41, 42].

Providing accurate information on alcohol effects on sexual experience could also be incorporated into motivational interviews aimed at reducing problematic patterns of consumption [43]. For example, Borsari and Carey [44] corrected misconceptions about alcohol effects as part of a multi-component brief motivational interview with heavy drinking college students. At 6 weeks post-intervention, participating students reported a lower average number of drinks per week, as well as less frequent heavy drinking. Thus it appears that providing accurate information about alcohol's effects on sexual experience as a way to debunk overly positive beliefs could be incorporated into a range of different intervention approaches, with the downstream goals of reducing drinking in sexual situations and thereby also reducing risky or adverse sexual outcomes.

Strengths and Limitations of the Present Study

The present study has a number of important strengths which serve to enhance confidence in its findings. First, by focusing on typical sexual events and using data from a large, representative, community sample of individuals, the present study can be seen as providing important, potentially generalizable descriptive information about the nature of everyday sexual experience and how it varies across sober and intoxicated states among adolescents and young adults in contemporary Western cultures. Second, the structure of our data enabled the use of within-person analytic techniques to test the association between alcohol use and subjective sexual experience. Because individuals serve as their own controls, such techniques provide a stronger basis for causal inference by helping to rule out stable individual differences *between* those who drink and those who do not as an alternative explanation for observed alcohol effects. Third, the inclusion of a sufficiently large number of units at both the individual ($n = 1946$) and event ($n = 7442$) levels ensured adequately powered tests of both the main and interactive effects of expectancies and alcohol consumption on sexual experience. As a result, even our null findings are more compelling than many previously published results. Fourth and relatedly, the large sample of individuals and sexual events—much larger than any previously published study—allowed for more accurate and reliable estimation of expectancy and alcohol effect sizes. Fifth, by assessing multiple aspects of subjective sexual experience, the present study provides a richer and more nuanced characterization of subjective sexual experience than past studies, which have focused on a more limited range of measures of sexual experience.

At the same time, several limitations of this research must be acknowledged. First, retrospective self-reports of behavior in specific sexual events are subject to a host of well-documented random and systematic errors of reporting [45], particularly when reports of sensitive behaviors are involved [46]. Although such concerns cannot be eliminated, they can be minimized by following recommended protocols during the data collection phase, as was done in the present study (see [25], for details). Moreover, given that recently experienced events are more accurately recalled than temporally distant ones, it is worth noting that 30 % of sexual events in the present study occurred within the last week and 45 % within the last 4 weeks. Accordingly distortions due to the passage of time should be minimized for a non-trivial portion of our events.

It is also possible that the lack of significant cross-level expectancy × alcohol interactions could be due to a mismatch between the content of our expectancy measures and the nature of outcomes examined. Indeed, this seems especially likely for the disinhibition/increased risk expectancies measure as such beliefs should logically predict disinhibited or risky behavior under the influence, but not necessarily the quality of one's sexual experience. However, we do not find this to be a compelling explanation for the weak pattern of effects for enhancement expectancies, which appear to provide a close conceptual match to the subjective aspects of sexual experience examined in the present study. For example, it seems perfectly reasonable that an individual who believes that alcohol makes one "feel closer to a sexual partner," might—to the extent that expectancies function as a self-fulfilling prophecy—feel more in love with his or her partner after drinking alcohol. Likewise, individuals endorsing the item, "I enjoy sex more than usual," might well feel more positive and less negative emotion on intoxicated than sober sexual occasions. Or similarly, those who believe that alcohol makes them "a better lover"

could reasonably be expected to feel more confident about their sexual prowess on drinking than non-drinking sexual occasions. Yet none of these effects was observed. In short, we do not believe that the generally weak pattern of enhancement expectancy interactions can be attributed to poor conceptual fit between the content of our expectancy and sexual outcome measures, though this might well explain the lack of findings for the disinhibition/increased risk expectancy composite.

Finally, it is important to acknowledge limitations on causal inference. Although the within-subjects design strengthens the internal validity of the study by helping to rule out stable individual differences as an explanation for observed differences between intoxicated and sober sexual events, our design does not allow us to rule out reverse causation or other factors that might covary with alcohol use across situations. Thus due caution should be exercised in attributing causality to the presence of alcohol in the situation.

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