

THE ROLE OF UNREALISTIC OPTIMISM
IN COLLEGE STUDENT
ALCOHOL-RELATED RISKY SEXUAL BEHAVIOR

By

SUSANNA VICTORIA LOPEZ

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Thesis Approved:

Thad R. Leffingwell, Ph.D.

Thesis Adviser

Misty Hawkins, Ph.D.

Ashley Clawson, Ph.D.

Name: SUSANNA VICTORIA LOPEZ

Date of Degree: JULY, 2018

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Abstract:

Introduction: Risky sexual behavior (RSB), especially after alcohol use (RSB-A), remains an issue among college students (Cooper, 2002). Engaging in RSB often results in sexually transmitted infections and unintended pregnancy, which are increasing at alarming rates among young adults (CDC, 2016; Finer & Zolna, 2014). One risk factor for engaging in RSB and RSB-A may be unrealistic optimism (UO), or a misperception of risk of experiencing a negative event. Though UO has been found to be related to engagement in certain behaviors such as smoking (Shepperd et al., 2013), less is known about the role of UO in RSB-A among college students. The purpose of the current study was to investigate the presence of UO in a college student sample, analyze associations between UO and current RSB and RSB-A patterns, and to analyze alcohol use as a moderator in the relation between RSB and RSB-related UO.

Methods: Undergraduate students ($N = 665$) from a large, Southern Plains university completed an online study assessing RSB patterns, alcohol use, and risk perceptions of RSB-related consequences.

Results: Dependent sample t -tests revealed that, relative to perceived risk of the average college student, students reported lower perceived *personal* risk of sexual activity (with and without concurrent alcohol use), unintended pregnancy, and contracting HPV and chlamydia ($ps < .01$). One-sample t -tests revealed that, compared to national data, students overestimated their own chances of sexual engagement with 1-3 partners and underestimated chances of HPV infection and sexual engagement with 4 or more partners in the next year ($ps < .01$). Alcohol use was found as a moderator between RSB and sexual activity with one partner, condom use, sexual activity after alcohol use, and condom use during alcohol-related sexual activity ($ps < .001$) such that lower alcohol use strengthened these relationships.

Discussion: The current study demonstrated the presence of UO regarding RSB-A and related consequences in a college student sample, but also demonstrated acknowledgement of higher risk of these consequences among those reporting higher alcohol use. Future research should investigate these behaviors and consequences over time. Implications for intervention are discussed.

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CHAPTER I

INTRODUCTION

Risky sexual behavior (RSB), defined as any sexual activity that increases the likelihood of contracting sexually transmitted infections (STIs) or unexpected pregnancy (e.g., sexual activity with multiple or unknown partners or failing to use condoms or other forms of birth control), is common among college students in the United States (Cooper, 2002). A national survey has found that 10% of college students have had 4 or more sexual partners within the last year. An alarming rate of only 50% of students have used condoms during sex in the last month, and 45% of students either did not use a form of contraception or did not know if contraception was used the last time they engaged in sex (ACHA, 2015). Judging by these statistics, college students engage in these risky behaviors quite frequently.

The consequences of engaging in RSB occur frequently and in some cases are increasing at alarming rates. Half of all pregnancies in the U.S. are unintended, and for women in the 20-24 age range, 64% of pregnancies are unintended (Finer & Zolna, 2014; Leslie et al, 2016). In the United States, there is an estimated incidence of 20 million cases of STIs every year. Half of these cases occur among adolescents and young adults ages 15 to 24 (Centers for Disease Control and Prevention [CDC], 2016). Adolescent and college-age student populations have the highest risk of experiencing negative consequences of RSB.

RSB often occurs after alcohol use, which is referred to as alcohol-related RSB (RSB-A). Research has shown that as the amount of alcohol consumption increases, intent to engage in safe sex decreases (Rehm, Shield, Joharchi, & Shuper, 2012). This relationship is especially apparent when drinking in situations in which sexual activity is expected to occur, such as on a date, and has been found to predict increased frequency of casual sex and indiscriminate partner choice (Cooper, 2002; Manthos, Owen, & Fincham, 2014; Fielder & Carey, 2010). Findings have been mixed regarding the relation between alcohol use and subsequent condom use during sex. While correlational studies broadly conclude that no relationship exists, lab-based experiments find that increased alcohol use leads to decreased intentions to use condoms (Brown & Venable, 2007; Scott-Sheldon, Carey, & Carey, 2010; Scott-Sheldon, Carey, Cunningham, & Carey, 2016). These findings indicate that college students who drink generally have a higher risk for engaging in RSB and RSB-A than those who do not drink.

One reason students engage in RSB and RSB-A might be unrealistic optimism, which is a misperception of the risk of experiencing a negative event relative to others or to actuarial risk. Individuals believe they are both more likely to experience positive events than others and less likely to experience negative events than others (Weinstein, 1980). In this case, students might engage in RSB-A because they perceive their own risk of pregnancy or contracting an STI as significantly lower than either their perceived risk of the average college student (i.e., comparative unrealistic optimism) or actual base-rate data (i.e., absolute unrealistic optimism).

Researchers have found unrealistic optimism (UO) across a variety of risks such as smoking-related illness, cancer, heart disease, alcohol use, and contracting STIs (Shepperd, Klein, Walters, & Weinstein, 2013; Weinstein, 1980; Rothman, Klein, & Weinstein, 1996). Compared to cigarette smokers who were accurate in personal risk perceptions, unrealistically optimistic

smokers were less likely to contemplate quitting and more likely to perceive cigarettes as less harmful than they are (Dillard, McCaul, & Klein, 2006). College students who were unrealistically optimistic about avoiding negative alcohol-related consequences were more likely to experience these consequences (Dillard, Midboe, & Klein, 2009). These examples demonstrate that UO may be a way to rationalize and justify risky behavior, and would thus be maladaptive to an individual's health. Researchers have sought to correct UO among these college students; for example, personal narratives and self-affirmation have been found to be efficacious in improving accuracy of risk of experiencing alcohol-related consequences (Kim & Niederdeppe, 2016). Whether this correction of risk perception translates to decreased risky behavior is currently unknown.

Additionally, research has explored the relationship between UO and STIs. Rothman and colleagues (1996) used base-rate data to determine whether college students exhibited UO about contracting chlamydia and HPV and discovered that personal risk perceptions were indeed significantly lower than objective risk (Rothman, Klein, & Weinstein, 1996). Studies have also shown unrealistic optimism for contracting HIV/AIDS in men who have sex with men such that, relative to those who practice safe sex, those who do not practice safe sex underestimate personal risk of contracting the disease (van der Pligt, Otten, Richard, & van der Velde, 1993). A study evaluating perceptions from a sample of gay men found that 42% of participants engaged in RSB, but only 9% perceived their behaviors as risky (Bauman & Siegel, 1987). Interestingly, men who were seropositive for HIV were more likely to be unrealistically optimistic about developing AIDS than men who were seronegative for HIV, but those who were unrealistically optimistic also engaged in significantly more health behaviors (e.g., exercising and proper diet)

than those who were more accurate in their risk estimate (Taylor et al., 1992). This suggests that UO is not always a determining factor for engaging in certain health behaviors.

The literature investigating how unrealistic optimism applies to RSB-A is sparse. One study sought to understand risk perceptions of experiencing unplanned sexual situations and its relationship to subsequent alcohol consumption. Klein, Geaghan, and MacDonald (2007) reported negative associations between perceived risk of having unplanned sex and levels of alcohol use, suggesting that perceived risk plays a role in amount of alcohol consumption in contexts of sexual behavior. Furthermore, actually engaging in unplanned sex increased personal risk estimates, and those who underestimated risk of engaging in unplanned sex reported higher alcohol use a few months later. This appears to be the only study evaluating RSB-A and unrealistic optimism.

To date, no studies have evaluated UO about engaging in specific behaviors of alcohol-related risky sexual activity or possible outcomes from engaging in these behaviors. The purpose of the current study is to investigate the potential role of UO in RSB and RSB-A among college students. It is hypothesized that both absolute and comparative UO for unplanned pregnancy, STIs, and engaging in RSB and RSB-A will be present in the college student population. That is, students will perceive they have less chance than objective data (*absolute* UO) to engage in sex with 1 to 4 partners, contract HPV and chlamydia, and become unintentionally pregnant. Students will also perceive themselves less likely than their own perception of the average college student (*comparative* UO) to engage in sexual activity, contract HPV and chlamydia, and become unintentionally pregnant. However, consistent with the definition of UO, we expect that students will believe they are *more* likely than others to use condoms at next sexual encounter and to avoid sexual activity after alcohol use. Moreover, greater engagement in RSB will be

positively correlated with stronger UO in each of the items listed above. Finally, it is hypothesized that alcohol use will moderate each of these relationships such that these relationships will be strongest among heavier drinkers.

CHAPTER II

METHODOLOGY

Participant Selection and Recruitment

Participants were obtained via a convenience sample from undergraduate students at a large, Midwestern university. Eligible participants were 18 years or older and received credit required for their psychology course as compensation for participation. Participants completed all measures via an anonymous, online survey. All procedures were approved by the university's Institutional Review Board.

Procedures

All measures were completed through an online survey. Participants self-selected into the study through a participant recruitment system, at which point they were redirected to the online survey. Participants automatically received credit once they completed the survey, a process that allows participants' responses to remain anonymous.

Measures

Demographics. Participants responded to demographic questions that include gender, age, ethnicity, sexual orientation, class standing, current living situation, Greek system involvement, and marital or dating status.

Risk perceptions. Personal risk estimates for (1) engaging in sexual activity with one partner, (2) two partners, (3) three partners, and (4) four or more partners, (5) condom use at next sexual encounter, (6) HPV infection, (7) chlamydia infection, (8) unintentional pregnancy, (9)

sexual activity after drinking alcohol, and (10) condom use after alcohol-related sexual activity were assessed. The term “RSB” refers to items 1-5, while “RSB-A” refers to items 9 and 10. Items were measured with questions such as, “What is the percent chance that you will have sex without a condom the next time you have sex?” and, “What is the percent chance that you will be infected with HPV in the next year?”. Responses ranged from 0 (0% chance) to 100 (100% chance).

Target risk estimates, or risk perceptions for the average male or female college student of the same age, were assessed for the same 10 items as above in order to investigate comparative UO in the sample. Participants were asked questions such as, “What is the percent chance that the average college student your age and sex will engage in sexual activity without a condom the next time they have sex?” and, “What is the percent chance that the average college student your age and sex will be infected with HPV in the next year?”. Responses ranged from 0 (0% chance) to 100 (100% chance).

To calculate *absolute* UO, the mean personal risk estimate for each item was compared to objective prevalence data obtained from the National College Health Assessment-II (NCHA-II; ACHA, 2015) and from the 2015 report of STD surveillance from the CDC (CDC, 2016). Absolute UO would be present if mean personal estimates were significantly lower than national risk data. RSB-A as well as condom use at next sexual encounter were not included in this analysis because national, objective data were not found for these items.

To calculate *comparative* UO, mean target risk estimates for all 10 items were compared to their respective mean personal risk estimates. Comparative UO would be present in the sample if personal estimates were lower than target estimates for risky behaviors consequences (e.g., HPV infection) but higher for responsible behaviors (e.g., condom use).

Risky sexual behavior. In order to assess patterns of sexual activity, participants responded to the Cognitive Appraisal of Risky Events- Revised (CARE-R; Katz, Fromme, & D'Amico, 2000). This self-report measure assesses risky behavior of young adults in the past 6 months, as well as expected risks and benefits of engaging in these behaviors. Risky activities assessed in this questionnaire include alcohol use, drug use, sexual activity with a regular or new partner, and sexual activity while under the influence of alcohol. The CARE-R in this sample demonstrated acceptable internal consistency ($\alpha = .79$). Participants then answered questions from the Alcohol-Related Sexual Behavior Scale (Lewis, Lee, Patrick, & Fossos, 2007; Logan, Koo, Kilmer, Blayney, & Lewis, 2015). These questions assess RSB and alcohol use during the past three months. Participants will be asked how many times they have engaged in sexual activity, consumed alcohol before engaging in sexual activity, used condoms during sexual activity after consuming alcohol, and how many drinks they have consumed, on average, before engaging in sexual activity. For the first 3 questions, responses ranged from 0 (0 times) to 15 (15 or more times). For the last question, responses ranged from 0 (0 drinks) to 15 (15 or more drinks).

Alcohol use. The Frequency Quantity Questionnaire (FQQ; Dimeff, Baer, Kivlahan, & Marlatt, 1999) is a self-report measure that assesses patterns of alcohol use over the past two weeks. Items assess for the number of drinks consumed during the heaviest drinking episode, the number of days alcohol was consumed, and the number of days the participant drank to get drunk. Participants also completed the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985), a 4-item self-report measure that measures the number of alcoholic drinks consumed and the number of hours spent drinking for each day during a typical week over the past month. High-volume drinkers are those who report consuming at least 12 drinks in a typical

week. Moderate drinkers report consuming between 4 and 11 drinks during the week, while infrequent drinkers or abstainers report drinking less than once per month (Collins et al., 1985). The DDQ further assess the frequency of drinking episodes over the past month with an 8-point scale ranging from “never” to “every day.” Finally, participants will report the average number of alcoholic drinks consumed in a single occasion over the past month.

Validity items. Two scales of the Elemental Psychopathy Assessment (Lynam et al., 2011) were utilized and dispersed throughout the survey in order to detect random or inaccurate responses from participants. One of these scales was the infrequency scale, which consists of 8 items that, when answered truthfully, should be rarely endorsed by participants. Some of these items include statements such as, “I frequently forget my middle name” and “I never speak to anyone during the day.” Participants responded to these items on a scale of 1 to 5 (strongly disagree to strongly agree). Random responders were detected if they answer positively on at least 4 of the 8 items (Lynam et al., 2011). In addition, the virtue scale is made up of 8 items that are thought to be very frequently endorsed when answered truthfully. An example includes, “I have never been envious of anyone else.” A participant who endorsed at least 3 of these items were considered to have responded randomly or inaccurately (Lynam et al., 2011).

At the end of the survey, five items were included to further assess validity of responses. Four of these items have response options of true or false. These are, “I read the instructions carefully prior to completing relevant items,” “I answered all items honestly and accurately,” “I answered items randomly without reading the items,” and “My responses are an accurate reflection of my views.” The data of participants who answered at least one of these in a way that indicated invalid responding were closely examined to evaluate validity of responses. The last question of the survey asked whether there was any reason we should not use their data. An

answer of “yes” directed participants to explain in their own words a reason that their data should not be used. Before responding to the true/false questions and the final question, participants were assured that they would still receive credit for participating in the study no matter how they responded to the final validity questions.

Data were screened for outliers and missing data prior to analysis. A total of 735 participants consented to participate in the study. Of those, 14 (1.90%) admitted to random or dishonest responding, 23 (3.12%) met criteria for random or dishonest responding on validity scales, and 33 (4.50%) did not complete the majority of the survey. The final sample consisted of 665 participants. Outliers ($n = 16$) were replaced with the value of three standard deviations and one integer above the mean (Tabachnick and Fidell, 2007).

First, one-sample *t*-tests were used to determine differences between personal perceptions of risk and objective data (analyzing absolute UO). Second, dependent-samples *t*-tests were used to compare perceptions of personal risk with the participants’ own perceptions of risk for the average college student (analyzing comparative UO). Third, correlational analyses were conducted to examine relationships between past frequency of RSB and UO for RSB, RSB-A, STIs, and unplanned pregnancy. Lastly, 10 separate moderation analyses were conducted, each with RSB as the independent variable and UO for each of the 10 items listed above as the dependent variable. Alcohol use, calculated as drinks per week, was analyzed as the moderator for each moderation analysis. Each moderation controlled for gender, age, and dating status. Bias-corrected bootstrapping with 10,000 resamples via the PROCESS macro (Hayes, 2013) was utilized for each moderation.

CHAPTER III

RESULTS

Sample characteristics

The final sample ($N = 665$) consisted of primarily female ($n = 454, 68.3\%$) participants with a mean age of 19.39 ($SD = 1.95$). Participants identified as Caucasian ($n = 516, 77.6\%$), African-American ($n = 41, 6.2\%$), American Indian ($n = 41, 6.2\%$), Hispanic ($n = 26, 3.9\%$), Asian ($n = 19, 2.9\%$), Biracial or mixed ($n = 15, 2.3\%$), Other ($n = 4, 0.6\%$), and Pacific Islander ($n = 3, 0.5\%$). When asked about marital or dating status, 13 (2.0%) reported being married or engaged, 76 (11.4%) reported casually dating, and 249 (37.4%) reported being in an exclusive relationship. Four hundred seventy (70.7%) reported lifetime sexual activity, with an average of 5.41 ($SD = 8.54$) lifetime partners and a mean age of 16.29 ($SD = 1.93$) as the age of first sexual experience. Participants reported a mean score of 4.51 ($SD = 6.31$) on the CARE-R. Participants further reported drinking an average of 5.66 ($SD = 7.93$) drinks per week. Men reported 2.17 ($SD = 3.76$) binge drinking episodes per month, while women reported 1.62 ($SD = 2.66$) binge drinking episodes per month. In this sample, participants reported experiencing 4.55 ($SD = 4.98$) alcohol-related consequences in the past 30 days.

Absolute unrealistic optimism at the group level

One-sample t -tests were conducted to determine absolute UO at the group level. Significant differences emerged such that participants reported an increased likelihood of engaging in sexual activity with 1, 2, and 3 partners compared to nationally reported data on past-year number of partners ($ps < .001$; see Table 1), which did not demonstrate UO as

hypothesized. Significant differences were also observed for perceived likelihood of having 4 or more sexual partners such that participants reported decreased likelihood of engaging in 4 or more partners ($M = 8.01$, $SD = 19.34$) compared to nationally reported data, $t(599) = -2.90$, $p = .004$. Participants demonstrated UO for this item. When asked about the chances of becoming infected with HPV, participants reported a significantly less chance of HPV infection than nationally reported prevalence of 42.5% among those between 18 and 59 ($M = 1.67$, $SD = 5.71$, $t(599) = -175.14$, $p < .001$), indicating significant absolute UO. Significant differences were found such that participants overestimated their likelihood of unintentional pregnancy when comparing to a national prevalence of 1.4% among college students ($M = 5.16$, $SD = 11.49$, $t(600) = 8.01$, $p < .001$). This overestimation of risk indicates that absolute unrealistic *pessimism* was found in this sample for unintentional pregnancy. Finally, no significant differences emerged in perceptions of chlamydia infection, $t(597) = 1.18$, $p = .24$, suggesting an absence of UO for this item. Results are summarized in Table 1. Due to the absence of nationally objective data, items for RSB-A and condom use at next sexual encounter were not included in this analysis.

Comparative unrealistic optimism at the group level

Dependent samples *t*-tests were conducted to determine comparative UO at the group level. Significant differences emerged for sexual engagement with 1, 2, 3, and 4 partners in the next year, unintentional pregnancy, HPV and chlamydia infection, and sexual engagement after drinking alcohol such that personal estimations of likelihood were less than target estimations of likelihood (see Table 2). Because perceived personal risk for these negative consequences were significantly less than perceived risk for the average student, comparative UO was found for each of these items. Furthermore, significant differences were observed such that personal estimations for condom use ($M = 66.74$, $SD = 42.31$) and condom use after alcohol intake ($M =$

49.36, $SD = 43.73$) were higher than target estimations for condom use ($M = 58.06$, $SD = 29.55$; $t(630) = 4.80$, $p < .001$) and condom use after alcohol intake ($M = 43.86$, $SD = 28.53$; $t(618) = 3.03$, $p = .003$). According to the definition of unrealistic optimism, students perceived themselves as more likely than others to engage in these responsible behaviors, indicating comparative UO for these items as well (Weinstein, 1980).

Bivariate correlations between patterns of RSB and RSB-related consequences

Individual UO scores were calculated in order to conduct correlational analyses between RSB and UO for RSB, RSB-A, STIs, and unplanned pregnancy. For each participant, personal risk estimates were subtracted from the corresponding target risk estimate to create an individualized UO score for each item. For example, an individual's personal risk estimate for contracting HPV was subtracted from his or her target estimate of HPV to create an overall, individual UO score for HPV. Positive scores indicate the individual's personal risk estimate was lower than the target risk estimate, demonstrating UO for sexual activity with 1-4 partners, HPV, chlamydia, and unplanned pregnancy and demonstrating unrealistic *pessimism* for condom use after sexual activity and after alcohol use. Negative scores indicate the personal risk estimate was higher than the target risk estimate, demonstrating UO for condom use after sexual activity and after alcohol use and demonstrating unrealistic *pessimism* for all other items. Correlational analyses revealed a significant, negative association between RSB and perceived likelihood of sexual engagement with one partner ($r = -.33$, $p < .001$), meaning higher RSB frequency was associated with negative UO scores (i.e., participants' personal risk estimates were higher than target risk estimates). RSB was also significantly and negatively correlated with perceived likelihood of sexual engagement after drinking alcohol ($r = -.29$, $p < .001$), again meaning higher RSB was associated with negative UO scores. A significant, positive correlation was observed

between RSB and perceived likelihood of condom use at next sexual encounter ($r = .09, p = .03$), suggesting higher RSB frequency was associated with positive UO scores (indicating higher target estimates for using condoms than personal estimates). No other significant correlations with RSB frequency were observed ($ps > .05$), though several UO items were significantly and positively correlated with each other (see Table 3).

Alcohol as a moderator of the relationship between patterns of RSB and UO for RSB-related consequences

Individual UO scores were again used for each moderation analysis. A separate moderation analysis was conducted for each of the 10 items relating to UO for RSB, RSB-A, STIs, and unintentional pregnancy. These items were analyzed as dependent variables, while RSB frequency was analyzed as the independent variable. Alcohol use, measured in drinks per week (DPW), was tested as a moderator for each analysis using bootstrap procedures with 10,000 resamples. Gender, age, and dating status were used as covariates. DPW did not significantly moderate the relationship between RSB and the likelihood of sexual engagement with 2 ($B = .002, p = .92, LLCI = -.046, ULCI = .050, \eta_p^2 = .09$), 3 ($B = -.009, p = .77, LLCI = -.069, ULCI = .051, \eta_p^2 = .07$), or 4 partners ($B = -.003, p = .94, LLCI = -.075, ULCI = .069, \eta_p^2 = .07$). It also did not significantly moderate the relationship between RSB and UO for HPV infection ($B = -.006, p = .57, LLCI = -.027, ULCI = .015, \eta_p^2 = .04$), chlamydia ($B = -.005, p = .70, LLCI = -.03, ULCI = .019, \eta_p^2 = .05$), or unintentional pregnancy ($B = .017, p = .37, LLCI = -.020, ULCI = .054, \eta_p^2 = .03$). RSB significantly predicted lower UO for sexual engagement with 1 partner (i.e., the perception that the average college student is significantly more likely than the individual to have sex with 1 partner). DPW significantly moderated this relationship such that the relationship was stronger among lighter drinkers. Conditional effects emerged at 1

SD above, below, and at the mean of DPW (see Table 4). Significant differences among the simple slopes emerged between conditional effects at 1 *SD* below and 1*SD* above the mean, $t(641) = 3.20, p = .001$. Significant differences also emerged between conditional effects at the mean and 1 *SD* above the mean, $t(641) = 2.11, p = .04$, but not between 1 *SD* below and at the mean, $t(641) = 1.31, p = .19$. Second, although RSB did not predict UO for condom use at next sexual encounter, a significant interaction emerged between RSB and DPW such that a significant, positive relationship was observed with DPW at 1 *SD* above the mean (see Table 5). Third, RSB significantly negatively predicted UO for engaging in sexual activity after alcohol use. DPW moderated this relationship such that this negative relationship was stronger among lighter drinkers versus heavier drinkers. Significant conditional effects emerged at 1 *SD* above, below, and at the mean (see Table 6). Significant differences among these effects occurred between 1 *SD* below and above the mean, $t(612) = 2.60, p = .01$. Significant differences did not occur between 1 *SD* below or at the mean, $t(612) = 1.08, p = .28$, or between the mean and 1 *SD* above the mean, $t(612) = 1.73, p = .08$. Finally, though RSB did not significantly predict UO for condom use during alcohol-related sexual activity, a significant interaction emerged such that a significant, positive relationship was observed with at 1 *SD* above the mean. Conditional effects were nonsignificant among lighter and average drinkers (see Table 7).

CHAPTER IV

DISCUSSION

The current study is among the first to examine alcohol-related risky sexual behavior and its consequences from the perspective of unrealistic optimism. An examination of *absolute* UO (i.e., comparing perceived personal risk with objective data) revealed partial support for original hypotheses. Participants believed they were personally more likely to engage in sex with 1, 2, and 3 partners than the average college student, but less likely with 4 or more partners. In other words, absolute UO was not present for sex with 1-3 partners, but was present for 4 or more partners. Absolute UO was not present for chlamydia or unintentional pregnancy, but was present for the possibility of HPV infection. This is especially concerning given that prevalence of HPV is much higher than what college students reported their personal risk to be. This indicates a need for continued efforts to promote HPV education and prevention, as health education has been found to improve HPV awareness and vaccination rates (Thompson, Butler-Barnes, Jones, Wells, Cunningham-Williams, & Williams, 2017).

An examination of *comparative* UO (i.e., a comparison of personal risk estimates with one's estimates of the average individual's risk) indicated that participants estimated lower personal likelihood of sexual activity with 1, 2, 3, and 4 or more partners compared to their own estimations in the average college student. Participants also believed they were less likely than the average college student to become unintentionally pregnant, become infected with HPV and chlamydia, and engage in sex after drinking alcohol. However, participants viewed themselves more likely to use condoms during sex, even after alcohol use. Taken together, these findings

suggest that comparative UO is present in this sample of college students because students reported themselves to be less likely to experience negative consequences (e.g. HPV, pregnancy) and more likely to engage in responsible behavior (e.g. condom use). Interestingly, students inaccurately perceived themselves to be more sexually active than students really are (compared to objective data), but personally believed they were less sexually active than the perceived average student, resulting in seemingly mixed results about the presence of absolute and comparative UO. This discrepancy has been seen in previous studies, leading researchers to postulate that the two different kinds of UO may be separate constructs to a more extreme degree than was previously thought (Ruthig, Chipperfield, Perry, Newall, & Swift, 2007; Ruthig, Gamblin, Jones, Vanderzanden, & Kehn, 2017). One important piece of UO in this case, however, is whether the participants view these items as positive or negative events. If students perceive future sexual activity as an overall positive event, absolute (but not comparative) UO would be supported. If students perceive this activity as overall negative, then comparative (but not absolute) UO would be supported. Future research warrants further investigation about whether sexual activity in itself is perceived as positive or negative to more fully understand how these results fit with the definition of UO.

Another possible explanation involves the role of social norms theory (Perkins, 2002) on behavior, as research has consistently found students to overestimate norms of sexual behavior among their peers (e.g., Scholly, Katz, Gascoigne, & Holck, 2005; Hittner & Kennington, 2008; Lewis, Atkins, Blayney, Dent, & Kaysen, 2013). Evidence further suggests this overestimation, as well as underestimation of protective sexual behavior such as condom use, may be a factor in riskier patterns of sexual behavior, as students may choose to engage in risky behaviors to fit with what they believe to be socially normative (Lewis, Litt, Cronce, Blayney, and Gilmore,

2014). It may be that both misperceptions of normative behavior and UO are risk factors for engaging in RSB. Several studies have used the social norms approach to intervention to reduce these risky behaviors with large success (e.g., Stephenson & Sullivan, 2009; Lewis et al., 2014; Kilwein, Kern, & Looby, 2017). Studies have also attempted interventions correcting UO, with many studies revealing only short-term effects of corrected misperceptions (Aucote & Gold, 2008; Sharot, Korn, & Dolan, 2011). Future research warrants the investigation of the interplay between normative perceptions and unrealistic optimism as well as interventions addressing both constructs.

Hypotheses were partially supported when examining correlations between self-reported patterns of RSB and UO for experiencing RSB-related behaviors and consequences. To restate, individual UO scores were created by subtracting personal risk estimates from participants' corresponding target risk estimates. Positive scores demonstrated UO for sexual activity with 1-4 partners, HPV, chlamydia, and unplanned pregnancy and unrealistic *pessimism* for condom use after sexual activity and after alcohol use. Negative scores demonstrated UO for condom use after sexual activity and after alcohol use and unrealistic *pessimism* for all other items. RSB was negatively correlated with UO for engaging in sexual activity with one partner. That is, higher RSB frequency was associated with negative UO scores, indicating participants' personal risk estimates were higher than target risk estimates. Lower RSB frequency was associated with UO scores indicating smaller, less negative discrepancies between personal and target estimates. RSB was also found to be negatively correlated with UO for sexual engagement after drinking alcohol, which again suggests that higher RSB indicated participants' personal risk was higher than target risk. This may demonstrate reasonable – not unrealistic – risk estimates given students' past RSB patterns. Someone who engages in RSB more often is likely to engage in

more frequent sexual activity overall, thereby estimating higher chances of engaging in sex in the future (with or without prior alcohol use) relative to others. Furthermore, RSB frequency was positively associated with UO for future condom use. In other words, higher RSB frequency was associated with UO scores indicating higher target estimates for using condoms than personal estimates. This discrepancy between RSB engagement and UO for condom use may indicate rationalization of engaging in risky behaviors (Dillard et al., 2006), or it may suggest a willingness to learn from and improve upon past experience (Ruthig et al., 2017). Future research should examine longitudinally whether these individuals do use condoms at next sexual encounter.

Moderation analyses demonstrated partial support for the original hypotheses. Alcohol use did not moderate patterns of RSB and perceived likelihood of pregnancy, HPV, chlamydia, or sexual activity with 2, 3, or 4 partners. This may be due to the relatively low average DPW in this sample. Because alcohol use has been established as a risk factor for STIs (Khan, Berger, Wells, & Cleland, 2012; Cook & Clark, 2005), unplanned pregnancy (Terplan, Cheng, & Chisolm 2014; Connery, Albright, & Rodolico, 2014), and higher number of sexual partners (O'Hara & Cooper, 2015), it may be that studying a sample with more high-risk drinkers could potentially influence results on alcohol use as a moderator in these relationships as well as on the magnitude of UO overall. Moreover, unlike past research (Klein, Geaghan, & Macdonald, 2007), questions in the current study asked about potential sexual activity with specific numbers of sexual partners instead of asking about the potential sexual activity in general, which could have influenced results. Finally, low base-rate of certain items such as college student pregnancy and chlamydia, as researchers have discussed low base-rate consequences as a potential weakness of UO (Shepperd et al., 2013).

Alcohol use did, however, significantly moderate the relationship between patterns of RSB and perceived sexual activity with 1 partner in the next year after controlling for gender, age, and dating status. The greatest UO was observed among light and average drinkers such that those who reported low RSB patterns perceived themselves to be significantly less likely than the average college student to engage in sex with 1 partner. Conversely, those who reported high RSB patterns thought sexual engagement to be more likely. Contrary to our hypothesis, this relationship was significantly weaker among heavier drinkers. Those who reported high RSB and low alcohol use had the *highest* perception of likelihood for sex with 1 partner.

Next, moderation analysis examining alcohol use as a moderator for RSB patterns and the perceived likelihood of sexual activity after alcohol use revealed significant results, though not in the way that was hypothesized. Again, the RSB-UO relationship was strongest among light and average drinkers. Interestingly, those who reported low alcohol use and low RSB believed they were significantly less likely than the average college student to engage in sex after drinking alcohol. The relation between RSB and UO in this situation was significantly weaker among higher levels of alcohol use, demonstrating that those with higher RSB patterns and higher alcohol intake reported that others are not much more likely engage in alcohol-related sex. However, no one, on average, believed they were *more* likely than others to engage in this behavior.

Overall, it appears that higher alcohol use indicated lower UO for sexual activity with or without alcohol use. These findings contradict those found in Dillard, Midboe, & Klein (2009), who demonstrated that higher alcohol consumption was associated with greater UO about experiencing negative alcohol-related consequences as well as actually experiencing those consequences. The results of the current study suggest that engaging in sexual activity, especially

after alcohol use, may be due to factors other than a misperception of one's risk for negative events. There is some research to suggest that RSB is not necessarily related to *levels* of drinking; rather, certain motives for drinking such as enhancement and conformity may be potential key factors in these risky behaviors (Kilwein & Looby, 2018; Bujarski, Capron, Gratz, & Tull, 2017). Further investigation on alcohol levels versus other alcohol-related factors on RSB is warranted.

Alcohol use also moderated the relationship between RSB patterns and perception of condom use at next sexual experience, regardless of alcohol intake. Although no change in UO was observed among light or average drinkers, a moderated effect emerged among heavier drinkers such that those who reported low RSB patterns thought themselves much more likely than the average college student to use condoms than did those who reported high RSB patterns. Although those with heavier alcohol use patterns and high RSB patterns still reported greater personal likelihood for condom use, this self-other discrepancy was diminished. Overall, these results suggest that those with higher drinking levels and low RSB patterns demonstrated highest perceived likelihood for condom use.

Lastly, a moderation analysis was conducted examining alcohol as a moderator for RSB and UO for condom use after alcohol-related sex. The moderated effect was only observed among heavier alcohol use patterns such that those reporting low RSB displayed greatest UO for condom use, while those reporting high RSB displayed weaker UO (i.e., self-other discrepancies were diminished). These results, as well as results for condom use regardless of concurrent alcohol use, may be concerning for those who may have little to no sexual experience, as alcohol use during first sexual experience is associated with failure to use condoms, especially if one or

both partners were intoxicated (Sprecher, 2013). Interventions integrating alcohol use and RSB feedback may be especially useful for these individuals (Lewis et al., 2014).

Results regarding RSB patterns and perceptions of condom use again contradicted the original hypothesis. Based on previous research (e.g. Taylor et al., 1992; Schoenbaum, 1997), we expected that those engaging in RSB most frequently would demonstrate greatest UO for condom use. However, these individuals exhibited *weaker* UO than those reporting less frequent RSB. This may be due to a certain degree of acknowledgement about sexual practices, and suggests that not all those who engage in risky behaviors misperceive risk of negative events to an unhealthy extent. Future studies should utilize longitudinal data to measure outcomes of condom use to determine which individuals believed they would use condoms during alcohol-related sex, but did not.

The current study adds important and novel information in a number of ways. It illuminates discrepancies between objective data and self/other perceptions by examining absolute and comparative UO concurrently, which is a deficit in the literature emphasized by a number of researchers studying unrealistic optimism (Shepperd et al., 2013). Additionally, the current research evaluates perceptions for both positive (e.g. condom use) and negative (e.g. HPV) sexually-related occurrences, offering a comprehensive study of UO rather than an exclusive look at negative events. This research also investigates differences in UO among different levels of alcohol use, providing novel information in the UO literature. Moreover, this study reveals potential areas for intervention, namely sexual health education (as evidenced by misperceptions in HPV and sexual behavior) and intervention among those with high alcohol consumption and low sexual experience.

Though this study advances research in several ways, there are still limitations to consider. First, the sample consisted of primarily female, Caucasian students, decreasing generalizability to college students nationwide. Second, all data were collected via self-report measures, increasing probability of dishonest or random responses. However, validity items were included in anticipation of this issue. Next, data collection was taken at one time point. Because of the cross-sectional nature of the study, outcomes of perceived likelihood of consequences were not measured. Future studies should utilize longitudinal designs to examine outcomes of sexual activity and consequences, which would confirm the presence of unrealistic optimism in the sample. Moreover, because HPV is not a nationally reportable disease, no data for HPV infection specifically for college students exist. The CDC presents data for prevalence estimates from the ages of 18-59, a considerably larger age bracket than the college-student age range.

The current study demonstrated the presence of UO regarding RSB-A and consequences in a sample of college students. Students reporting low drinking levels and low RSB patterns were exhibited highest UO for sexual engagement, with and without concurrent alcohol use. Furthermore, students reporting heavier alcohol consumption and low RSB patterns exhibited highest UO for condom use, with and without concurrent alcohol use. Future studies should investigate these relationships over time to examine outcomes of RSB and consequences, and whether actually experiencing negative outcomes increases risk estimates. Finally, interventions preventing RSB should target individuals with higher drinking levels and little to no sexual experience, as these students may be at risk for risky sexual activity.

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Table 1.

Comparison of personal risk estimates and objective data.

Variable	Personal Perception		Test value				95% CI	
	Mean	SD	Mean	Mean difference	t	p	LL	UL
Sex with 1 partner	63.17	40.73	43.2	19.97	12.51	<.001	16.83	23.10
Sex with 2 partners	20.81	30.25	9.4	11.41	9.33	<.001	9.01	13.82
Sex with 3 partners	12.78	24.73	5.7	7.08	7.02	<.001	5.10	9.06
Sex with 4 partners	8.01	19.34	10.3	-2.29	-2.90	.004	-3.84	-.74
Accidental pregnancy	5.16	11.49	1.4	3.76	8.01	<.001	2.84	4.68
HPV infection	1.67	5.71	42.5	-40.83	-175.14	<.001	-41.29	-40.37
Chlamydia	2.05	7.22	1.7	.35	1.18	.24	-.23	.93

Note. Personal perceptions measured on a scale of 0 (no chance) to 100 (certain to occur). Test value indicates prevalence within the population.

Table 2.

Paired t-tests

Variable	Personal perception		Target perception		Mean difference	t	p
	Mean	SD	Mean	SD			
Sex with 1 partner	63.48	40.59	73.42	30.20	-9.94	-6.84	<.001
Sex with 2 partners	20.95	30.33	54.24	32.30	-33.30	-24.24	<.001
Sex with 3 partners	12.88	24.83	41.41	31.43	-28.53	-21.52	<.001
Sex with 4 partners	8.06	19.42	31.14	29.67	-23.08	-18.56	<.001
Unplanned pregnancy	5.18	11.53	24.99	22.41	-19.81	-21.19	<.001
HPV infection	1.68	5.74	19.25	20.39	-17.57	-21.17	<.001
Chlamydia	2.06	7.25	21.41	21.66	-19.36	-21.78	<.001
Condom use	66.74	42.31	58.06	29.55	8.68	4.80	<.001
Alcohol-related sex	35.24	35.65	58.72	30.52	-23.48	-15.03	<.001
Condom use A-RSB	49.36	43.73	43.86	28.53	5.50	3.03	.003

Note. Personal and target perceptions measured on a scale of 0 (no chance) to 100 (certain to occur).

Table 3.

Correlations among RSB frequency and UO for future behaviors and consequences.

Variable	1	2	3	4	5	6	7	8	9	10	11
1. RSB frequency	-										
2. Sex with 1 partner	-.334**	-									
3. Sex with 2 partners	-.044	.354**	-								
4. Sex with 3 partners	-.019	.251**	.863**	-							
5. Sex with 4 partners	.021	.167**	.694**	.864**	-						
6. Unplanned pregnancy	-.034	.202**	.392**	.414**	.439**	-					
7. HPV infection	.003	.194**	.413**	.441**	.431**	.632**	-				
8. Chlamydia	.044	.164**	.456**	.487**	.473**	.575**	.821**	-			
9. Condom use	.085*	.175**	.122**	.071	.053	.039	.037	.016	-		
10. Alcohol-related sex	-.291**	.467**	.519**	.424**	.385**	.378**	.393**	.361**	.172**	-	
11. Condom use A-RSB	.050	.170**	.198**	.145**	.114**	.053	.084*	.064	.601**	.330**	-

Note. * $p < .05$; ** $p < .01$

Table 4.

Moderation model and conditional effects of RSB patterns and DPW on UO for sex with one partner controlling for gender, age, and dating status.

Variables	Coeff.	SE	<i>t</i>	<i>p</i>	95% CI		η_p^{2c}
					LLCI	ULCI	
RSB patterns	-1.52	.22	-7.09	<.001	-1.95	-1.10	.32
DPW	-.54	.18	-2.94	.003	-.89	-.18	.08
RSB patterns*DPW	.08	.02	.75	<.001	.05	.11	.01
Gender	2.20	2.95	.75	.45	-3.58	8.00	.01
Age	-.31	.61	-.51	.61	-1.50	.89	.00
Dating Status	-9.24	1.44	-6.44	<.001	-12.06	-6.42	.28
95% CI							
Conditional effects	Coeff.	SE	<i>t</i>	<i>p</i>	LLCI	ULCI	η_p^{2c}
One <i>SD</i> below the mean	-1.97 ^a	.27	-7.40	<.001	-2.50	-1.45	.34
At the mean	-1.52 ^b	.22	-7.09	<.001	-1.95	-1.10	.32
One <i>SD</i> above the mean	-.90 ^{a,b}	.20	-4.42	<.001	-1.30	-.50	.16
Model Summary	<i>R</i> ²	ΔR^2	F	df1	df2	<i>p</i>	η_p^{2c}
	.19	.016	30.29	6	638	<.001	.22

Note. Parameter estimates based on 10,000 bootstrap samples. The confidence interval indicates a 95% bias-corrected bootstrap confidence interval.

^{a-b} Matching superscripts indicate significant pairwise differences at $p < .05$.

^c Effect sizes derived from the original sample.

Table 5.

Moderation model and conditional effects of RSB patterns and DPW on UO for condom use at next sexual encounter controlling for gender, age, and dating status.

Variables	Coeff.	SE	<i>t</i>	<i>p</i>	95% CI		η_p^{2a}
					LLCI	ULCI	
RSB patterns	.22	.35	.62	.53	-.48	.92	.003
DPW	-.74	.22	-3.30	.001	-1.20	-.30	.09
RSB patterns*DPW	.10	.02	3.85	<.001	.05	.14	.12
Gender	8.92	3.52	2.54	.01	2.02	15.82	.06
Age	2.66	.95	2.79	.005	.79	4.53	.07
Dating Status	4.54	1.92	2.37	.02	.78	8.31	.05
Conditional effects	Coeff.	SE	<i>t</i>	<i>p</i>	95% CI		η_p^{2a}
One <i>SD</i> below the mean	-5.83	.44	-.77	.44	-1.19	.52	.01
At the mean	.22	.35	.62	.53	-.48	.92	.003
One <i>SD</i> above the mean	.99	.32	3.05	.002	.35	1.62	.08
Model Summary	<i>R</i> ²	ΔR^2	F	df1	df2	<i>p</i>	η_p^{2a}
	.06	.016	8.32	6	624	<.001	.07

Note. Parameter estimates based on 10,000 bootstrap samples. The confidence interval indicates a 95% bias-corrected bootstrap confidence interval.

^a Effect sizes derived from the original sample.

Table 6.

Moderation model and conditional effects of RSB patterns and DPW on UO for alcohol-related sexual activity controlling for gender, age, and dating status.

Variables	Coeff.	SE	<i>t</i>	<i>p</i>	95% CI		η_p^{2b}
					LLCI	ULCI	
RSB patterns	-1.49	.24	-6.22	<.001	-1.96	-1.02	.28
DPW	-1.33	.20	-6.62	<.001	-1.72	-.93	.30
RSB patterns*DPW	.07	.02	3.51	<.001	.03	.111	.11
Gender	7.99	3.09	2.59	.01	1.93	14.06	.06
Age	.50	.88	.56	.58	-1.24	2.24	.01
Dating Status	-.29	1.49	-.19	.85	-3.21	2.63	<.001
95% CI							
Conditional effects	Coeff.	SE	<i>t</i>	<i>p</i>	LLCI	ULCI	η_p^{2b}
One <i>SD</i> below the mean	-1.91 ^a	.31	-6.20	<.001	-2.52	-1.31	.27
At the mean	-1.49	.24	-6.22	<.001	-1.96	-1.02	.28
One <i>SD</i> above the mean	-.91 ^a	.22	-3.99	<.001	-1.36	-.46	.13
Model Summary	<i>R</i> ²	ΔR^2	<i>F</i>	<i>df</i> ₁	<i>df</i> ₂	<i>p</i>	η_p^{2b}
	.17	.013	25.44	6	609	<.001	.20

Note. Parameter estimates based on 10,000 bootstrap samples. The confidence interval indicates a 95% bias-corrected bootstrap confidence interval.

^a Matching superscript indicates significant pairwise difference at $p < .05$.

^b Effect sizes derived from the original sample.

Table 7.

Moderation model and conditional effects of RSB patterns and DPW on UO for condom use during alcohol-related sexual activity controlling for gender, age, and dating status.

Variables	Coeff.	SE	<i>t</i>	<i>p</i>	95% CI		η_p^{2a}
					LLCI	ULCI	
RSB patterns	.08	.33	.25	.80	-.56	.73	<.001
DPW	-1.24	.22	-5.74	<.001	-1.66	-.82	.24
RSB patterns*DPW	.11	.02	5.16	<.001	.07	.15	.21
Gender	6.56	3.56	1.84	.07	-.44	13.55	.03
Age	2.04	.78	2.61	.009	.51	3.58	.06
Dating Status	6.29	1.88	3.34	.001	2.60	9.99	
95% CI							
Conditional effects	Coeff.	SE	<i>t</i>	<i>p</i>	LLCI	ULCI	η_p^{2a}
One <i>SD</i> below the mean	-.55	.40	-1.37	.17	-1.33	.23	.10
At the mean	.08	.33	.24	.80	-.56	.73	<.001
One <i>SD</i> above the mean	.94	.29	3.21	.001	.36	1.52	.09
Model Summary	<i>R</i> ²	ΔR^2	<i>F</i>	df1	df2	<i>p</i>	η_p^{2a}
	.09	.021	13.60	6	612	<.001	.12

Note. Parameter estimates based on 10,000 bootstrap samples. The confidence interval indicates a 95% bias-corrected bootstrap confidence interval.

^a Effect sizes derived from the original sample.

APPENDIX A. Review of the Literature

College student risky sexual behavior (RSB)

Risky sexual behavior (RSB) is defined as any sexual activity that increases the likelihood of contracting sexually transmitted infections (STI) or unexpected pregnancy. This includes sexual activity with multiple partners and without protection such as condoms or other forms of birth control (Cooper, 2002). RSB is common among college student and young adult populations despite continued efforts to educate these groups about safe sex (Clifton, Penrose, Prien, & Farooqi, 2015; Hodges, Klaaren, & Wheatley, 2000). According to the American College Health Association, 10% of college students have had at least 4 sexual partners in the past year alone. Out of all students who reported engaging in sexual activity in the last month, 45% either did not use a form of contraception or did not know if contraception was used the last time they engaged in sexual activity. Only 50% of college students reported using condoms in the last month (American College Health Association – National College Health Assessment [NCHA], 2015). As the data suggest, college students are engaging in these risky behaviors quite frequently and have remained relatively stable over the last fifteen years (<https://www.acha.org/>).

Consequences of RSB

Consequences such as unplanned pregnancy and STIs result from engaging in RSB. In the United States, nearly half (45%) of all pregnancies are unexpected, and intended pregnancy rates are falling while unintended rates are rising (Finer & Zolna, 2014, 2016). Women ages 18-24 have the highest rate of unplanned pregnancy; 76% of pregnancies in women ages 18 and 19 and 59% of pregnancies in women ages 20-24 are unintended (Finer & Zolna, 2016). Among

female college students, 1.3% have experience unplanned pregnancy, and 17.6% reported using emergency contraception within the past year.

According to the Centers for Disease Control and Prevention (CDC), the incidence of STIs is estimated to be 20 million cases per year. Adolescents and young adults are most at risk for these STIs, as half of all cases occur in those ages 15-24. Unfortunately, chlamydia, gonorrhea, and syphilis rates combined have recently reached record numbers, and those in the 20-24 age bracket contain the highest number of these STIs (CDC, 2016).

The 2015 CDC report indicated that adolescents and young adults aged 15-24 years accounted for 64.3% of all chlamydia cases, with the highest rate occurring in women ages 20-24 (3,730.3 per 100,000 females). Men 20-24 had the second highest rate with 1,467.8 cases of chlamydia per 100,000 males, indicating a 7.8% increase from 2014 to 2015 (CDC, 2016). Women 20-24 were also the group with the highest rate of all Gonorrhea cases (546.9 per 100,000 females), with men 20-24 following closely (539.1 per 100,000 males; CDC, 2016). Finally, rates of syphilis have increased dramatically from 2014 to 2015. Syphilis cases in adolescents ages 15-19 have increased 10.2%, while cases in young adults ages 20-24 increased 14.9% (CDC, 2016). These alarming statistics clearly indicate that adolescent and young adult populations are among the most at risk for experiencing consequences of RSB.

RSB and alcohol use

One factor that has been linked to RSB is alcohol consumption. The relationship between alcohol use and RSB is complex, as outcomes of sexual behaviors differ with factors such as partner type (i.e., monogamous vs. inconsistent partners), age, and alcohol expectancies. Broadly, studies support the notion that alcohol consumption is positively associated with RSB (Cooper, 2002). Alcohol use is correlated with greater likelihood of subsequent sexual

intercourse, particularly when drinking in situations in which sexual activity is likely to occur, such as on a date (Cooper, 2002). Alcohol consumption and intoxication are significant predictors of RSB such that higher levels of drinking predict casual sex and indiscriminate partner choice (e.g., Manthos, Owen, & Fincham, 2014; Fielder & Carey, 2010).

A multitude of studies have indicated that alcohol use does not have any effect on condom use (Cooper, 2002; Brown and Vanable, 2007; Scott-Sheldon, Carey, and Carey, 2010). Though this conclusion has remained relatively stable, differing patterns emerge when additional factors are taken into account. For example, alcohol use does appear to reduce the use of condoms in younger, sexually inexperienced individuals (Cooper, 2002). Further, results have been mixed regarding the effect of partner type on alcohol consumption and condom use. Brown and Vanable (2007) conducted an event-level study and found that alcohol use was positively associated with unprotected sex when sexual partners were inconsistent, but no association was found with regular (i.e., committed and monogamous) partners. According to LaBrie and colleagues (2005), greater levels of alcohol consumption occurred with new partners as opposed to regular partners, and alcohol use was only associated with decreased condom use with new or casual partners. In contrast, Scott-Sheldon, Carey, and Carey (2010) concluded that heavy alcohol consumption was associated with unprotected sex when partners were steady. They argued that this occurs because steady sexual relationships are thought to be less risky than sex with strangers or non-steady partners, though this may not always be the case. Steady partners may still be infected with STIs, increasing risk for uninfected partners.

Correlational studies relying on self-report have been augmented with lab-based experiments. In these studies, participants are brought to a certain blood alcohol content (e.g. BAC = .08) and questioned about intent to use condoms for hypothetical sexual situations. Meta-analyses

concluded that as BAC increased, intentions to use condoms decreased, especially with high sexual arousal (Rehm, Shield, Joharchi, & Shuper, 2012; Scott-Sheldon, Carey, Cunningham, & Carey, 2016). These findings are supported by other recent in-lab experiments, which found that alcohol use decreased intentions to use condoms in a sample of 436 women (Davis, et al., 2014) and increased intentions and positive attitudes toward resisting condom use in a male sample (Davis et al., 2016). In the sample of women, alcohol intoxication moderated the relationship between condom use self-efficacy and condom negotiation. For women with high condom use self-efficacy, alcohol actually increased condom negotiation ability, while women with low self-efficacy were less likely to negotiate condom use while intoxicated (Davis et al., 2014). Taken together, these findings suggest that alcohol use negatively affects condom use intentions for both partners. Coupled with low self-efficacy in women, drinking lessens the likelihood of condom negotiation and subsequent condom use.

Causal theories of alcohol-related RSB

Cooper (2006) explained two theories that underlie the causal relationship between alcohol consumption and subsequent RSB. One is called the alcohol-myopia theory (Steele & Josephs, 1990). This theory asserts that alcohol disinhibits one's ability to maintain safe sexual behaviors. Alcohol decreases cognitive capabilities, limiting an individual's ability to perceive and process certain cues. This creates a "myopic" effect for the intoxicated individual; while more complex cues such as fear of STIs (i.e., "inhibiting cues") are filtered out, more salient and immediate cues (i.e., "impelling cues") such as sexual arousal remain perceivable, which leads to unsafe sexual activity. This effect is especially noticeable when faced with situations that are controversial in nature, such as deciding whether to engage in sexual activity with a highly attractive partner when no protection is available (Griffin, Umstadd, & Usdan, 2010). Research

supporting alcohol-myopia theory in relation to RSB is well-documented (Kaly, Heesacker, & Frost, 2002; Griffin, Umstadd, & Usdan, 2010). Monahan and Lannutti (2000) observed the relationship between alcohol consumption and intentions to engage in high-risk sexual activity in an all-female sample. Both sober and intoxicated women watched videos of men who described their ideal date and afterwards rated these men as potential dating partners. When the videos described risky sexual situations, intoxicated women were more likely than sober women to perceive these men as desirable dating and sexual partners. There were no such differences when the videos depicted low conflict, such as potential sexual activity with an unattractive partner.

One established mediator for alcohol-myopia theory and RSB is sexual arousal. Sexual arousal coupled with intoxication puts students at the highest risk of surrendering to the myopic effect, leading to decreased intentions of engaging in safe sex (Ebel-Lam, MacDonald, Zanna, & Fong, 2009; Wray, Simons, & Maisto, 2015). Research has investigated the roles of physiological arousal vs. subjective (or perceived) arousal on sexual risk-taking. Only subjective sexual arousal mediated the relationship between increased BAC and sexual risk-taking intentions. Surprisingly, alcohol did not affect physiological arousal in men and decreased arousal in women, while subjective arousal increased with high BAC levels in both genders (George et al., 2009; Norris et al., 2009). This illustrates how inhibiting cues (e.g., decreased physiological arousal) are filtered out, and impelling cues (e.g., subjective arousal) are magnified. In turn, focusing on these magnified cues leads individuals to engage in sexual risk-taking.

Another well-supported theory that Cooper (2006) describes is that of alcohol expectancies, which refer to predicted outcomes of alcohol consumption by the individual. The theory states that alcohol-related behavior is driven by certain beliefs regarding the effects of

alcohol. For instance, if an individual believes that drinking alcohol will lead to positive sexual experiences, then that increases the likelihood of that individual drinking before sex. Overall, people are more likely to engage in heavy drinking and RSB when alcohol is believed to be a sexual enhancer and disinhibitor (LaBrie et al., 2005; Matthews, Cho, Hughes, Wilsnack, Johnson, & Martin, 2013). Patrick and Maggs (2009) collected event-level data from college students over a period of two weeks and found that stronger positive expectancies, but not negative expectancies, were related to greater frequency of oral sex. These expectancies were not related to penetrative sex or condom use. Furthermore, positive expectancies predicted positive sexual experiences, but not negative experiences. A recent study followed adolescents and young adults for a period of 10 years (Cooper, O'Hara, & Martins, 2016). Results indicated that the belief that alcohol enhances and disinhibits sexual behavior resulted in higher levels of alcohol consumption prior to sex. Participants with stronger positive sexual enhancement expectancies reported higher sexual arousal when intoxicated, whereas those with weaker expectancies reported decreased arousal. These findings suggest that positive alcohol expectancies play an important role in perceived sexual arousal, the decision to engage in certain levels of sexual activity, and the decision to engage in alcohol use before sex.

The relations between alcohol expectancies and sexual activity may differ across varying groups. In gay and bisexual men, those with positive expectancies and attitudes toward casual sex reported the highest number of casual partners, while those with positive expectancies and negative attitudes toward using condoms reported the most unprotected sexual activity (Wells, Starks, Parsons, & Golub, 2014). In women, heavy drinkers had more positive physical and social expectancies and had more positive attitudes toward sex with casual partners than moderate or light drinkers. Although no differences emerged for lifetime number of partners

across the sample, heavy drinkers did report sexual activity with more casual partners than moderate or light drinkers (Stappenbeck et al., 2013). An interesting finding in this study concerned alcohol use patterns and beliefs about condom use: light drinkers actually reported negative attitudes toward condoms, which was not statistically different from the attitudes of heavy drinkers and was significantly lower than the attitudes of moderate drinkers. This may be because light drinkers associate condom use with casual sex, which was negatively viewed by light drinkers and those with low expectancies.

Third variables related to alcohol use and RSB

The relationship between alcohol and RSB can also be partially explained by other factors. For example, sexual sensation seeking is a significant predictor of alcohol-related RSB (Hendershot, Stoner, George, & Norris, 2007), and the relation between alcohol use and RSB is strengthened in individuals with high traits of sexual sensation seeking (Donohew, Zimmerman, Cupp, Novak, Colon, & Abell, 2000; Heidinger, Gorgens, & Mortgenstern, 2015). Impulsivity is also associated with alcohol-related RSB (Charnigo, Noar, Garnett, Crosby, Palmgreen, & Zimmerman, 2013). In fact, Charnigo et al. studied the combination of impulsivity and sensation seeking and learned that young adults were most likely to engage in alcohol-related RSB when they rated high on both of these traits rather than rating high on only one trait, implying that students who are high on impulsivity and sensation seeking are the most at risk for engaging in alcohol-related RSB.

Environmental factors also shape one's likelihood of engaging in alcohol-related RSB. Although the college environment as a whole increases risk for these behaviors, certain sub-groups of college students are at particular risk for alcohol-related RSB. For instance, Greek-affiliated college students report more alcohol use and RSB than their non-Greek counterparts

(Vail-Smith, Maguire, Brinkley, & Burke, 2010; Scott-Sheldon, Carey, & Carey, 2008). Student athletes are another group that report significantly more alcohol-related RSB than those not involved in college sports (Grossbard, Lee, Neighbors, Hendershot, & Larimer, 2007). These studies suggest that social environment plays an important role in patterns of alcohol-related RSB.

A significant factor of alcohol-related RSB involves peer normative perceptions and social norms theory (Cooper, 2006; Perkins, 2002). Students often overestimate the prevalence of risky behaviors occurring among college students, and this has been found to predict engagement in these behaviors (e.g., Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Merrill, Read, & Colder, 2012; Kilmer, Geisner, Gasser, & Lindgren, 2015). Specific to college student RSB, one recent study demonstrated that students overestimate the amount of casual sex and amount of drinking before sex the typical college student experiences (Lewis, Litt, Crouce, Blayney, & Gilmore, 2014). Importantly, these perceptions were positively correlated with behavior. Lewis and colleagues also found that students underestimated the frequency of condom use and other birth control methods during sex, but no association between these perceptions and condom use was found.

Protective factors of RSB

A number of factors that protect against RSB have been evaluated in the literature. Among college students, one such factor is self-regulation – the ability to control thoughts, behaviors, and emotions – which includes behavior planning and delayed gratification among other constructs (Quinn & Fromme, 2010). Dispositional self-regulation has been found to be negatively correlated with certain risky behaviors such as alcohol use and RSB (Wills & Stoolmiller, 2002; Galliot & Baumeister, 2007). In a study by Quinn and Fromme (2010), self-

regulation was inversely related to alcohol-related RSB, and interacted with sensation-seeking such that self-regulation served as a buffer against RSB only in those with low sensation-seeking. Overall, self-regulation has been found to protect against RSB, but this may not always be the case when other factors are taken into account.

Condom-related protective behavior strategies (PBS) are behaviors, such as carrying condoms and discussing condom use before sex, that are utilized to practice safe sex. In a study by Lewis, Kaysen, Rees, and Woods (2010), condom-related PBS were positively associated with condom use frequency reported in the last three months. Condom-related PBS were also associated with discussions of STI history and protection against STIs for the first sexual experience with their current partner(s). Alcohol-related PBS (e.g., alternating alcoholic beverages with non-alcohol beverages) were also protective against RSB through negative associations with sexual disinhibition and perceived expectancies of engaging in sexual risk-taking (Logan, Koo, Kilmer, Blayney, & Lewis, 2015). Alcohol-related PBS in this sample were further related to weaker sexual enhancement expectancies, but only among light drinkers. Alcohol-related PBS were not, however, related to condom use or frequency of alcohol-related sexual activity. Although alcohol-related PBS may not be directly associated with sexual behavior, they are significant in determining perceived expectancies of whether one will engage in future RSB.

Important group differences have been observed for protective factors. Among college-age females, confidence, self-esteem, independence, and life satisfaction are all protective factors against RSB (Morrison, Sieving, Pettingell, Hellerstedt, McMorris, & Bearinger, 2016). For HIV-negative men who have sex with men (MSM), positive peer normative perceptions about protected sex were protective factors against RSB. Being black or Latino in this group also

predicted safer sexual activity. In HIV-positive MSM, social support and positive peer norms for protected sex were associated with condom use (Forney & Miller, 2012).

Unrealistic Optimism (UO)

Another factor that likely contributes to alcohol-related RSB is unrealistic optimism (UO). UO is a term that describes a misperception of an individual's personal risk of a negative event relative to the risk of another group of individuals (Weinstein, 1980). People believe that they are both more likely to experience positive events and less likely to experience negative events than others. To illustrate this concept in the context of RSB, a college student might engage in sexual risk behaviors because he or she believes that compared to others or relative to actual base rates, his or her likelihood of pregnancy or contracting an STI is significantly lower.

Since Neil Weinstein introduced the term in 1980, UO has received substantial support from psychological research and has been demonstrated in a number of health conditions and risk behaviors (Shepperd, Klein, Waters, & Weinstein, 2013; Weinstein, 1980; Rothman, Klein, & Weinstein, 1996). For example, Dillard, McCaul, & Klein (2006) found UO among cigarette smokers (i.e., individuals whose personal risk estimate of contracting lung cancer were unrealistically low). Unrealistic optimists were less likely to contemplate quitting than those who were realistic in their risk perceptions. Smokers exhibiting UO were also more likely to believe that smoking was not as harmful as it actually is, which may be an attempt to rationalize and justify their smoking behavior. UO further extends to health conditions and behaviors such as STIs and alcohol use. Rothman and colleagues (1996) found that many college students demonstrated UO about contracting HPV and chlamydia, even though the chances of contracting these diseases from infected partners are 1 in 5 and 1 in 20, respectively (CDC, 2016; Torrone, Papp, & Weinstock, 2014). Lastly, college students who had UO about avoiding negative

alcohol-related consequences, such as missing classes, were actually more likely to experience those consequences up to over a year later (Dillard, Midboe, & Klein, 2009).

As can be seen, UO may be a way to rationalize engaging in risky behaviors and can be maladaptive to an individual's health. Researchers have sought to correct UO in an attempt to decrease risky behaviors. In a study aiming to improve accuracy of risk perceptions, college students participated in an intervention involving personal narratives and self-affirmation, which was efficacious in improving accuracy of their risk perceptions of experiencing consequences related to alcohol consumption (Kim & Niederdeppe, 2016). Whether this cognitive change translates to decreased alcohol use remains to be seen.

Measuring UO

Shepperd and colleagues (2013) discuss different types of UO. UO is made up of two categories: absolute and comparative optimism. Unrealistic absolute optimism asserts that one's personal risk perceptions are unrealistically lower (or higher for positive events) than that of an objective, or absolute, risk. Using an objective scale as a reference is optimal for cross-sectional designs or when studying outcomes that may not occur frequently. Rothman and colleagues (1996) demonstrated an example of this type of UO, since researchers compared participants' risk perceptions to actual rates of HPV and chlamydia.

Unrealistic comparative optimism compares individual risk estimates to the risk estimates of others. The participant may rate his risk of experiencing a negative event in relation to "the average man" or to a group of men. Dillard et al. (2009) measured unrealistic comparative optimism, where college students rated their risk estimates for experiencing negative alcohol-related consequences compared to that of the average college student.

Absolute and comparative optimism can be measured on an individual level and a group level (Shepperd et al., 2013). When measuring unrealistic absolute, individual optimism, risk perceptions are compared to an individual's own outcome. This method is best used in longitudinal studies, where outcome data are more reliable and accurate than using an individual risk algorithm or risk calculator (Shepperd et al., 2013). Unrealistic absolute optimism on the group level measures UO of a group as a whole and compares that group to a standard rate. With this method, researchers are unable to see whether a certain individual has UO; group level UO is used broadly to determine whether UO is present for some construct.

Measuring comparative, individual optimism requires the participant to compare his own risk to that of the average person (Shepperd et al., 2013). Risk algorithms and calculators are used to assess whether one is unrealistically optimistic; a participant's estimated risk that is above the calculated risk for that individual indicates UO. Finally, comparative optimism at the group level is assessed when participants estimate likelihood of an event occurring relative to the likelihood of their peers as a group experiencing the event (Shepperd et al., 2013). Measuring this type of UO requires the mean of all individuals' risk perceptions to be average (on a scale of low risk to high risk), indicating that some individuals acknowledge their high risk while others accurately perceive that they are not at risk for experiencing a certain negative event. If the sample mean is below average (meaning most people believe they are not at risk of a negative event), then UO is present for that group.

UO can be assessed using either direct or indirect scales. Using the direct method, participants are asked with a single item what they believe their personal risk is compared to others. Responses usually range from -3 ("Much less likely than most people") to +3 ("Much more likely than most people"; Helweg-Larsen & Shepperd, 2001, p. 75). Using the indirect

method, personal risk is assessed on a separate set of questions from assessing average, or target, risk. Participants typically respond on a probability scale of 0 to 100 or on a scale of 1 to 7 (very unlikely to very likely; Helweg-Larsen & Shepperd, 2001). According to Helweg-Larsen and Shepperd, both of these methods have their strengths: the direct approach is appropriate for determining whether broad differences exist for some event, while the indirect approach is appropriate for more detailed research, such as evaluating moderators of UO.

It is important to note that when using objective data for absolute optimism, the data should be specific to the sample that is being tested. For instance, researchers studying UO in a sample of college students should use objective, representative data also from college students. Furthermore, Shepperd and colleagues stress the importance of making sure that participants compare risk to a population that is relative to them. A female college student should estimate risk compared to the average female student their own age, for example.

Potential weaknesses of UO

Shepperd and colleagues (2013) also discuss possible weaknesses of the UO construct. It seems that UO becomes problematic specifically at the comparative and group level for negative events that have very low base rates. When studying rare events, there may not be anyone in the sample that will actually experience the event – a term called minority undersampling. In this case, nearly the entire group may believe that they are not at risk for experiencing the event, but these would be realistic perceptions rather than unrealistically optimistic ones. A solution to this would be to study multiple samples. Using this method, some samples may not have anyone at risk, while other samples may have an unusually high number of people experiencing the event. Researchers may then average across these samples, thus resolving the issue of minority undersampling.

Another issue involves scale attenuation, or a restricted range of responses (i.e., -3 to +3 rather than 0 to 100). Limiting participants to only a few options may lead to inaccurate responses. In the case of rare events, there may be a very small proportion of participants who are, in fact, at high risk for this event; due to the limited response range, however, these participants are not able to convey the seriousness of their risk. However, the authors believe that scale attenuation does not seriously affect the construct. Many studies have controlled for scale attenuation and have still found UO in their samples (e.g., Lee, 1989; Kreuter & Strecher, 1995; Hoorens, Smits, & Shepperd, 2008).

Finally, a weakness of UO may include base rate regression. This is the notion that people tend to overestimate an average person's risk of experiencing a rare outcome and underestimate the average person's risk of experiencing a very common outcome (Moore & Small, 2007). This occurs merely because the participant has no information of risk factors, prevalence and incidence rates of "the average individual." Since people do know about their own risk factors, they may accurately perceive their own risk but may be mistaken about the target risk. Although some researchers believe this to be a weakness of UO, Shepperd and colleagues actually view this as a supporting reason for why UO exists.

UO literature relating to RSB

In addition to the study by Rothman, Klein, and Weinstein (1996), other studies have evaluated UO and RSB. Among gay and bisexual men, those who do not practice safe sex are more likely to underestimate personal risk perceptions of contracting HIV compared to those who do practice safe sex (van der Pligt, Otten, Richard, & van der Velde, 1993). Another study involving an MSM sample found that 42% of participants engaged in RSB, but only 9% believed those behaviors to be risky (Bauman & Siegel, 1987). Surprisingly, while HIV-positive men

exhibited more UO than HIV-negative men, those who did have UO were significantly more likely to engage in more positive health behaviors such as diet and exercise (Taylor et al., 1992). This suggests that UO is not always a determining factor for engaging in certain healthy or risky behaviors.

The literature exploring UO and alcohol-related RSB is virtually nonexistent. One longitudinal study by Klein, Geaghan, and MacDonald (2007) investigated risk perceptions of engaging in RSB after alcohol use in college students. They reported that lower perceived risk of engaging in RSB correlated with higher levels of alcohol use, which suggests that risk perceptions are a factor of alcohol consumption and RSB. When evaluating outcome data four months later, the researchers demonstrated that actually experiencing RSB increased personal risk estimates. Furthermore, those who did engage in RSB (and were thus unrealistically optimistic) reported higher levels of alcohol use four months later. This appears to be the only study evaluating UO and alcohol-related RSB.

The current study

To date, no studies have evaluated UO pertaining to alcohol-related RSB or to possible outcomes from engaging in these behaviors. The purpose of the current study is to investigate the potential role of UO in alcohol-related RSB among college students. It is hypothesized that UO for unplanned pregnancy, STIs, and engaging in RSB and alcohol-related RSB will be present in the college student population. Moreover, UO in these areas will be positively associated with students who reported engaging in RSB. Finally, it is hypothesized that alcohol use will moderate this association, strengthening the relationship between RSB and UO.

Hypothesis 1: Unrealistic optimism for unplanned pregnancy, STIs, and engaging in RSB and alcohol-related RSB will be present in the college student population.

Hypothesis 2: There will be a positive association between past reports of RSB and UO for RSB, STIs, and unplanned pregnancy.

Hypothesis 3: Alcohol use will moderate the relationship between those who have engaged in RSB and unrealistic optimism for RSB, STIs, and unplanned pregnancy such that greater levels of alcohol use will strengthen the positive association between RSB and UO.

VITA

Susanna Victoria Lopez

Candidate for the Degree of

Master of Science

Thesis: THE ROLE OF UNREALISTIC OPTIMISM IN COLLEGE STUDENT ALCOHOL-RELATED RISKY SEXUAL BEHAVIOR

Major Field: Psychology

Biographical:

Education:

Completed the requirements for the Master of Science in Clinical Psychology at Oklahoma State University, Stillwater, Oklahoma in July, 2018.

Completed the requirements for the Bachelor of Science in Psychology at the University of Arizona, Tucson, Arizona in 2016.

Experience:

2016 – Present: Behavior Change Lab, Stillwater, OK
Graduate Research Assistant, Oklahoma State University
Adviser: Thad R. Leffingwell, Ph.D.

2015-2016: Naturalistic Observation of Social Interaction Laboratory, Tucson, AZ
Research Assistant, University of Arizona
Adviser: Matthias Mehl, Ph.D.

Professional Memberships:

Association for Behavioral and Cognitive Therapies
Addictive Behaviors SIG, ABCT
Psychology Graduate Student Association, Oklahoma State University