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ORIGINAL PAPER

The Association Between Alcohol Use and Engagement in Casual Sexual Relationships and Experiences: A Meta-Analytic Review of Non-Experimental Studies

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Abstract The present study provides a meta-analytic review of the association between alcohol use and engagement in casual sexual relationships and experiences (CSREs). Specifically, the meta-analysis focused on non-experimental studies of community and college samples. Results from the meta-analysis, which included 29 relevant studies (34 effect sizes), indicated that alcohol use was significantly associated with engaging in CSREs, $r = .34$, 95 % CI [.29–.38], but that this link showed considerable variability. Subsequent analyses examined moderators that may explain this heterogeneity. Results revealed that age and method of assessment significantly moderated the effect of alcohol use on CSRE engagement such that the association was greater for emerging adults (18–24 year olds) than older adults and online assessments produced greater effect sizes than paper-and-pencil assessments. These results have implications for future research and intervention development. In particular, this meta-analysis emphasizes the need for studies that utilize consistent measurements of CSRE engagement, include diverse methodology, and expand upon sampling.

Keywords Romantic relationships · Casual sex · Hooking up · Alcohol

Introduction

Courtship processes have changed substantially throughout the last century, and a great number of individuals are now experiencing sexuality outside of ongoing dating and marital relationships (for recent reviews, see Claxton & van Dulmen, 2013; Garcia, Reiber, Massey, & Merriwether, 2012; Heldman & Wade, 2010). Claxton and van Dulmen (2013) refer to these relationships and experiences as casual sexual relationships and experiences (CSREs). This term signifies that these relationships/experiences are casual (e.g., they are uncommitted and positioned in contrast to ongoing dating relationships), sexual in nature, and encompass both relationships and experiences. In particular, CSREs can be considered experiences because they fall outside of the romantic relationship context (see Furman & Collins, 2009), but many meet the requirements for a "relationship" because they involve interdependence (see Berscheid & Peplau, 1983).

CSREs differ concerning the emotional connection and relationship between the individuals involved (i.e., friends vs. strangers/acquaintances) and the length of the relationship/experience (short-term vs. ongoing) (e.g., Claxton & van Dulmen, 2013; Jonason, Luevano, & Adams, 2012; Wentland & Reissing, 2011). In the literature, terms for CSREs include hookups, one-night stands, friends with benefits, and booty calls (for a full review of the various CSREs, see Claxton & van Dulmen, 2013). While hookups, one-night stands, friends with benefits, and booty calls are the most common terms used to describe CSREs in the literature, it is important to note that some researchers also use variations of the term "casual sex" or "casual relationship" which generally focus on the lack of emotional connection and/or commitment between partners. Overall, while terms for CSREs differ, they possess the common features of being both casual (e.g., involving sexual behavior outside of a committed relationship) and sexual.

Prevalence

Most individuals report experiencing at least one CSRE within their lifetime (see Heldman & Wade, 2010; Garcia et al., 2012). Involvement in CSREs also increases with age. While in adolescence approximately 28 % of individuals report engaging in hookups (Fortunato, Young, Boyd, & Fons, 2010) can be as high

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as 78 % in early adulthood among college students (Lambert, Kahn, & Apple 2003; Paul, McManus, & Hayes, 2000). Furthermore, research suggests that the majority of young adults have engaged in friends with benefits (e.g., 60 %, Bisson & Levine, 2009) and booty call relationships (e.g., 64 %, Jonason, Li, & Cason, 2009).

Alcohol Use

Alcohol has been consistently linked with sexual behaviors. For example, alcohol use has been associated with engagement in sexual activity at a young age (e.g., age 16) (Crowe & George, 1989; Fergusson & Lynskey, 1996) as well as greater overall number of sexual partners (e.g., Desiderato & Crawford, 1995). Furthermore, alcohol use has been implicated in unprotected sexual behavior (i.e., condom usage, see Leigh, 2002; Rehm, Shield, Joharchi, & Shuper, 2012; Shuper, Joharchi, Irving, & Rehm, 2009 for meta-analyses and Halpern-Felsher, Millstein, & Ellen, 1996 for a review), risk for AIDS (see Fisher, Bang, & Kapiga, 2007), and having multiple or uncommitted sexual partners (see Cooper, 2002, 2006, and George & Stoner, 2000 for reviews).

Given these associations, it is not surprising that alcohol use serves as "one of the most reliable and robust predictors of casual sex behaviors" (Owen & Fincham, 2011a, p. 312). At an event level (i.e., drinking in combination with a specific sexual encounter), qualitative and quantitative studies suggest alcohol use precedes the majority of CSREs (e.g., Grello, Welsh, & Harper, 2006; Wentland & Reissing, 2011). Furthermore, on a global level, higher general alcohol use has been associated with higher rates of engaging in friends with benefits relationships, hookups, and one-night stands (Owen & Fincham, 2011a, b; Owen, Fincham, & Moore, 2011). For example, studies have found that college students consume an average of three drinks before engaging in a typical hookup (Fielder & Carey, 2010b). More importantly, there exists evidence suggesting a small association between CSREs involving alcohol and negative emotional reactions (Owen & Fincham, 2011b), lack of satisfaction (Paul & Hayes, 2002), and regret (Fisher, Worth, Garcia, & Meredith, 2012) (although for an exception see Owen, Quirk, & Fincham, 2014). While individuals do engage in CSREs while sober (e.g., Fisher et al., 2012), and alcohol use is primarily associated with only the first sexual encounter within a friends with benefits relationship (Wentland & Reissing, 2011), the overall research indicates a consistent association between alcohol use and CSRE engagement.

Potential Moderators

While alcohol use is associated with CSRE engagement, not all individuals who drink engage in CSREs and at the event-level drinking experiences and CSREs do not always co-occur. Furthermore there is variability regarding the magnitude of the association between alcohol use and CSRE engagement across studies. Identifying the moderators of this relationship could aid in explaining the inconsistencies in the degree to which these variables are associated in the current literature. A number of potential demographic and methodological moderators can be identified based on differences reported in either CSRE engagement or alcohol use associated with these variables.

Demographic Variables

Age, for example, is one potential moderator of the relationship between CSRE engagement and alcohol use. The association between alcohol use and CSRE engagement may be stronger during emerging adulthood (ages 18–29; Arnett, 2004) than other age periods. Emerging adulthood (particularly the age period of 18–24) is associated with significant increases in alcohol use compared to adolescence and later adulthood (Maggs & Schulenberg, 2004; Schulenberg & Maggs, 2002), and research suggests that problematic drinking (e.g., binge drinking) may peak around age 22 (see O'Malley, 2004). Researchers have also suggested that engagement in CSREs during emerging adulthood may be somewhat developmentally normative given that an important aspect of emerging adulthood is exploration especially in the realm of sexual and romantic relationships (see Arnett, 2004; Claxton & van Dulmen, 2013; Collins & van Dulmen, 2006; Stinson, 2010). Therefore, the association between CSRE engagement and alcohol use may be highest for emerging adults, particularly those between the ages of 18 and 24.

Even among emerging adults, the relationship between CSRE engagement and alcohol use may vary based on the specific population under study (e.g., college students versus community adults). Currently, most work in this area has focused on college students. However, there are substantial differences between the college environment and the workforce (e.g., Bogle, 2007, 2008). While researchers have argued that CSRE engagement is particularly prominent on college campuses and may be an outgrowth of the college context (e.g., Heldman & Wade, 2010; Stinson, 2010), little empirical research has fully examined this claim. On the other hand, some research has found evidence that non-college samples have a higher probability of engaging in high-risk sex (casual and unprotected sex) than college students (Bailey, Fleming, Henson, Catalano, & Haggerty, 2008; Bailey et al., 2011). Additionally, while non-college bound individuals tend to drink more in high school than college-bound high school students, once they transition into the college environment college students' alcohol use surpasses their non-college peers (see Schulenberg & Maggs, 2002). Therefore, while research has documented that alcohol use is higher for college samples, there is limited—and mixed—evidence that CSRE engagement is more prevalent in one group versus the other.

Gender also deserves attention as a potential moderator of the relationship between alcohol use and CSRE engagement. Research demonstrates that women are less likely to report desire for a CSRE than men (e.g., Townsend & Wasserman, 2011). While some studies find that men engage in more CSREs than women (e.g., Grello et al., 2006; Owen & Fincham, 2011a), in general the prevalence rates are similar (e.g., Bisson & Levine, 2009; Paul &

Hayes, 2002). Taken together, women report less desire for CSRE engagement but similar rates of actual CSRE engagement when compared to men. It is possible that alcohol use helps explain this discrepancy between intentions and behavior. Specifically, when individuals are intoxicated they may attend less to social repercussions of engaging in casual sexual behavior (see Cooper, 2002). Therefore, alcohol use may narrow the discrepancy between intensions and behavior (such that woman may have higher desire for CSRE engagement when intoxicated due to this release in fear of social repercussions). Additionally, research has shown that women are judged more negatively than men if they have a large number of sexual partners or engage in CSREs (e.g., Crawford & Popp, 2003). Consequently, women may be more likely than men to use alcohol in order to justify engaging in CSREs.

There is also reason to expect the association between CSRE engagement and alcohol use may vary depending on the country in which research is conducted. Cultures vary in regards to the relative restrictiveness or permissiveness of their values regarding sexuality (e.g., Christensen, 1969; Higgins, Zheng, Liu, & Sun, 2002; Sprecher & Hatfield, 1996). These contrasting views concerning sex outside of marriage may influence the association between alcohol use and CSRE engagement (e.g., Christensen, 1969). However, research to date has not systematically examined country as a potential moderator of the relationship between CSRE engagement and alcohol use.

Methodological Moderators

In addition to demographic variables, there are a number of differences in methodology between studies that may help explain discrepancies in the strength of the association between alcohol use and CSRE engagement. To date these differences have not been examined. Studies vary considerably in the way they assess CSRE engagement as well as alcohol use. The methods of assessing CSRE involvement (e.g., number of partners versus categorical assessments of CSRE engagement) as well as alcohol use (e.g., frequency versus quantity) may influence the strength of the relationship between CSRE engagement and alcohol use because different methods may provide more accurate estimations.

Different assessment methods (e.g., interviews, paper-and-pencil measures, and online assessment) may also influence the magnitude of the effect. Because sexual behaviors and alcohol use are particularly sensitive data, individuals may underreport (or overreport) their experiences depending on the way the data are collected. For example, research has suggested that face-to-face interviews are particularly prone to biased reporting (see Tourangeau & Yan, 2007). The research regarding difference between online and paper-and-pencil measures, however, is mixed. Most research finds either no differences between these methods or slight differences in favor of online studies (see Richman, Kiesler, Weisband, & Dragow, 1999 and Tourangeau & Yan, 2007 for meta-analyses).

The Current Study

Research has provided consistent findings suggesting that alcohol use is associated with CSRE engagement. While meta-analyses have examined the association between alcohol and other risky sexual behaviors such as unprotected sex (e.g., Leigh, 2002; Shuper et al., 2009), and HIV infection (e.g., Fisher et al., 2007), to date, no attempt has yet been made to synthesize the information regarding the association between alcohol use and CSRE engagement using meta-analytic techniques.

It is important to study the effects of alcohol use on CSREs in particular given their high prevalence rates and link to negative psychological consequences (including depression and low self-esteem, e.g., Fielder & Carey, 2010a) in addition to the physical consequences (i.e., STI and pregnancy risk) associated with other risky sexual behaviors (e.g., multiple partners, inconsistent condom usage). Furthermore, while there appears to be a link between alcohol use and CSRE engagement, the strength of this finding is not consistent from study to study. Because of this range in research findings, it is important to combine these results using a meta-analytic framework in order to obtain a clearer understanding of the findings.

Meta-analytic techniques provide a powerful tool to synthesize existing literature and make broad inferences about a population of studies (Borenstein, Hedges, Higgins, & Rothstein, 2010; Card, 2012). By combining many studies, a meta-analysis also provides high statistical power for overall effects and provides an estimate of the magnitude of an effect. Given that alcohol use is one of the most prominent risk factors for engaging in CSREs, understanding the overall strength of the association between alcohol use and engaging in CSREs could inform risk assessment and potentially lead to future interventions. Additionally, systematically examining moderators of the relationship between alcohol use and CSRE engagement using meta-analytic techniques could provide valuable information for understanding why some individuals who use alcohol engage in CSREs while others do not.

Therefore, the current study's overall aim was to combine results from the existent literature using a meta-analysis. We hypothesized that higher alcohol use levels would be associated with higher CSRE engagement levels across studies. We expected that this effect size would be moderate in size based on the previous literature. We also expected to find differences based on the moderators examined in the study. (1) Specifically, we hypothesized effect sizes would be highest for 18–24 year olds and lowest for older adults. (2) It was also predicted that effects would differ by population (college vs. community adult). Given the higher drinking rates and later age of marriage for college students it was expected that the association would be greater for college students than community adults. (3) It was hypothesized that the effect size between alcohol use and CSRE engagement would be greater for studies with higher proportions of women than men given differences between men and women regarding the desire for CSREs and social acceptability of engaging in

CSREs. (4) Regarding study method, we expected to find greater effect sizes in studies utilizing online and paper-and-pencil measures than in studies using interview techniques. While they were examined as potential moderators, no specific hypotheses were made regarding country, CSRE measurement, or alcohol measurement due to limited research regarding differences based on these factors.

Method

Study Identification and Selection

To identify relevant papers, literature searches were conducted using the *PsychINFO*, *SocINDEX*, and *PUBMed* databases. Search phrases utilized combinations of the following terms: *casual sex**, *friends with benefits*, *one night stand*, *booty call**, *hookup*, *hooking up*, *risky sex* behavior*, *uncommitted sex**, *alcohol, drink**, *and intoxicat**. Backwards searching methods (i.e., searching the reference sections of articles identified by the database searches for other relevant studies) and forward searching (attempts to find studies citing the studies identified previously by the database search) were also employed in order to identify additional studies (see Card, 2012). Specifically, references of Cooper (2002), Grello et al. (2006), and Owen and Fincham (2011a, b) were searched to find additional potential studies. Finally, to obtain unpublished studies, the corresponding authors of several articles included in this review were contacted and asked to provide any unpublished or non-significant findings; usable effect-size data from one study was obtained this way.

Figure 1 summarizes the search results (based on meta-analysis reporting guidelines; Moher, Liberati, Tetzlaff, & Altman, 2009). Initial searches revealed over 1,000 potential studies published before March 1, 2014. Of these studies, titles and abstracts were reviewed and 66 articles were retained for full paper review. Articles were screened using a number of inclusion criteria. Articles were retained for analysis if they were (i) available in English, (ii) empirical in nature (qualitative studies, case studies, reviews, and theoretical articles were not included). Studies also needed to (iii) include a statistical association between alcohol use and CSRE engagement and (iv) assess alcohol use independently from other substance use (e.g., marijuana). Given our focus on the association between alcohol use and CSRE behavior (see inclusion criteria iii) experimental studies, which generally measure intention rather than behavior (see, for example, Cho & Span, 2010), were not included in the current meta-analysis.

Studies that examined populations that might have different patterns of sexual engagement than individuals in the general population were excluded. Specifically excluded were (i) studies that examined commercial sex workers (e.g., Lavoie, Thibodeau, Gagne, & Herbert, 2010), (ii) studies of exclusively HIV positive individuals and studies with the specific purpose of tracking the spread of HIV (e.g., Jacobson et al., 2012), (iii) studies specifically focusing on drug users (e.g., Sutcliffe et al., 2009), and (iv) studies that examined condom use as the sole measure of sexual behavior (e.g., Castilla, Barrio, Belza, & de la Fuente, 1999). Studies with a focus on (v) extra-relationship CSREs (i.e., cheating) or (vi) non-consensual sex (e.g., sexual aggression) were also excluded because CSREs falling under these categories may represent different acts than voluntary CSREs between non-committed (i.e., single) individuals.

When otherwise eligible articles lacked sufficient statistical information, corresponding authors were contacted and asked to provide the omitted information (requested information was provided for one article). If the needed data could not be obtained, studies were left out of the analysis ($N = 5$)[1] or when possible estimates of effect size (e.g., lower-bound estimates) were utilized ($N = 1$). In total, 29 studies satisfied all search criteria.

Study Coding

The first and second authors independently coded each study for sample specific characteristics, measurement characteristics, study quality, and effect size information. Minor discrepancies were resolved through discussion and reviewing the articles together until consensus codes were reached. Reliability analyses revealed moderate to good reliability on study variables (ranging from .84 to 1.0).

Sample Specific Characteristics

The studies were coded for their publication year and country of origin (United States/other). Articles were also coded for a number of demographic characteristics including age (coded as the mean age in years of the sample. If the study reported a range of ages but not the mean, the midpoint of this range was used. If age was not reported, an estimated age was calculated by taking the school grade of the sample plus five—see Card, 2012), predominate gender (>60 % male, >60 % female, or mixed), and study population (coded as adolescent, college, and community adult).

Measurement Characteristics

Articles were coded for methodological characteristics including method of data collection (i.e., if the assessment utilized paper-and-pencil questionnaires, responses to online surveys, or responses to individual interviews). CSRE measurement was also coded and fell into four basic categories: dichotomous (has or has not had), lifetime CSRE partners, number of partners within a given time frame, and category of most recent partner. Alcohol use measurements were also categorized into four major categories.

[1] Studies for which specific effect size information could not be obtained were Apostolopoulos et al., 2002; Bersamin et al., 2012; Carroll and Carroll, 1995; Kiene et al., 2009; and Leigh and Schafer, 1993. These studies, however, all reported positive associations between CSRE engagement and alcohol use.

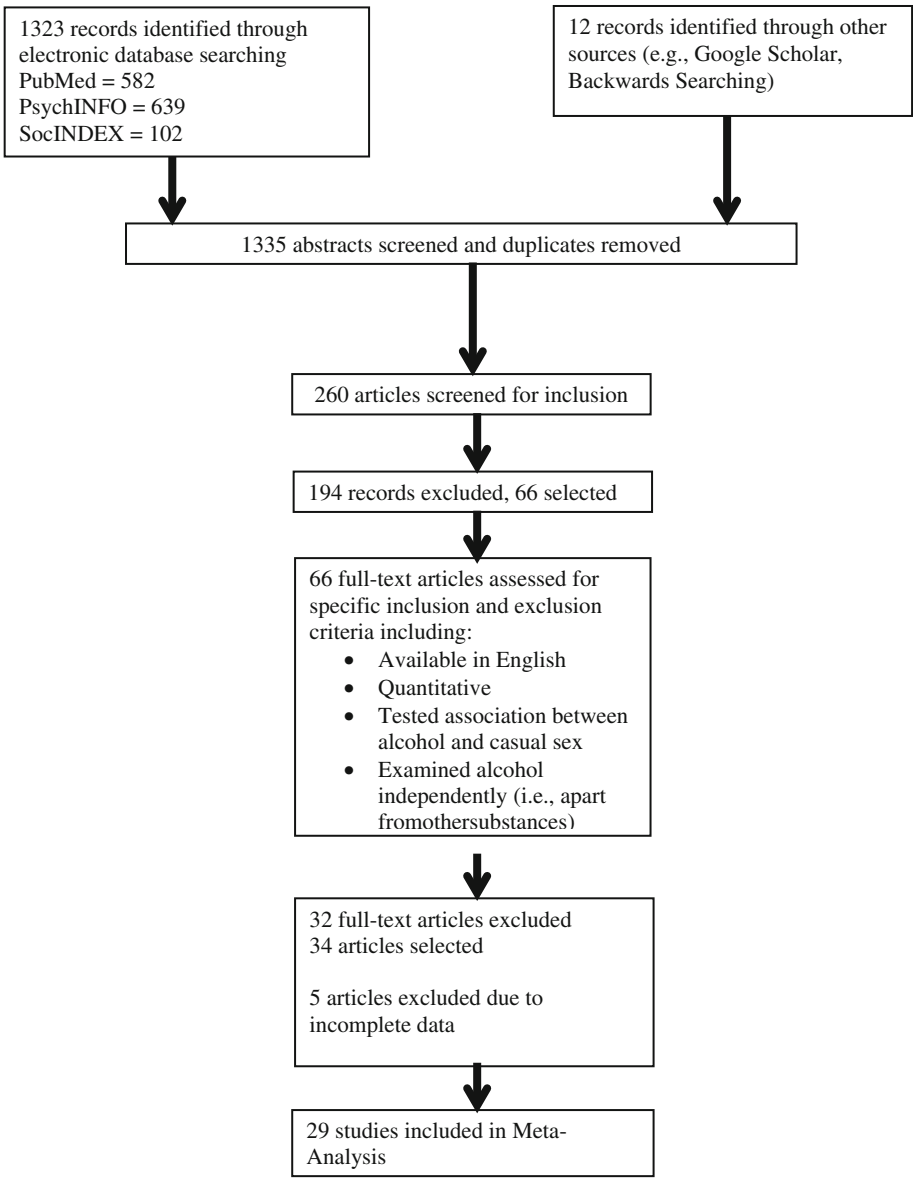

Fig. 1 Search results

Many articles measured alcohol use using a composite which was generally based on frequency and quantity of alcohol use during a typical week in the past month and frequency of heavy drinking (e.g., more than five drinks on a single occasion). In other instances, alcohol consumption was measured as a dichotomous variable (e.g., had vs. had not consumed alcohol prior to engaging in a CSRE(s); drinker vs. non-drinker). Other studies examined the quantity of alcohol use in a specific time frame or, alternatively, examined frequency of alcohol use in a specific time frame (e.g., past week, past month).

Study Quality

Studies were coded regarding presence or absence of reliability and validity characteristics. Studies were coded as having adequate reliability if they presented evidence that the CSRE engagement (alcohol use) reliability reached acceptable criterion (e.g., $\alpha > .8$). If specific reliability estimates were given, the nature of these values was coded (e.g., if they came from internal consistency estimates, split half, or test–retest estimates). A citation to an external source or statement saying internal consistency was "acceptable" was considered evidence of reliability even when the specific value was not reported (see Cooper, 2010; Cooper, Hedges, & Valentine, 2009 for guidelines). Similar procedures were followed regarding the validity of the alcohol and CSRE measures. Studies were coded depending on whether or not they mentioned the measure's validity (yes/no). When validity was reported, the specific value was recorded and the validity score's nature was coded (e.g. concurrent validity, citation from another study, or predictive validity).

Effect Size Coding

Effect size information was coded from the results sections of the various studies. Effect sizes were coded such that positive effects represent a link between greater alcohol use and greater levels of CSRE engagement. If studies included continuous measures of CSRE engagement and alcohol use, the *r* value (correlation) between the two variables was recorded. The *r* value was either directly coded from each study or the mean, SD, and sample size in each group was recorded. When the study included a dichotomous CSRE measure but a continuous alcohol use measure the means and SDs for the groups were coded. Finally, if both alcohol use and CSRE engagement were dichotomous, the number and/or percentage of the CSRE and the non-CSRE groups endorsing alcohol use were coded. When the sample size was not reported in an article, the *n*s were calculated based on the percent and the group *n*. When results were presented separately for males and females both effect sizes were included in the analyses (as separate samples) since the data is considered non-independent (Lipsey & Wilson, 2001). This was also done for one study presenting results from high-school and middle-school students (i.e., Fortunato et al., 2010).

Data-Analytic Strategy

The statistical software program Comprehensive Meta-Analysis, Version 2 (Borenstein, Hedges, Higgins, & Rothstein, 2005) was utilized for all data-analysis. Various effect sizes were first calculated using the information provided in the articles in accordance with recommendations and computations provided by Card (2012). Three general effect size indices were utilized for this meta-analysis: Pearson product-moment correlation (i.e., *r* index), standard mean difference scores (i.e., *d* index), and the logged odds ratio (Card, 2012; Cooper, 2010). These effect sizes were then used to calculate a weighted mean effect size (i.e., overall effect size estimate).

Common Effect Size

In order to obtain a common effect size based on these various effect-size reporting methods in the literature, all effect sizes were converted to the *r* statistic within the Comprehensive Meta-Analysis program. This decision was made based on several advantages for using *r* as a common effect size. The *r* statistic allows for the inclusion of as many studies as possible for the current study. Furthermore, *r* is interpretable and commonly used in the meta-analysis literature, and *r* can be calculated from Hedges *g* and the LOR without substantial distortion (Card, 2012; Cooper, 2010). Most importantly, CSRE engagement and alcohol use are conceptually continuous variables, and therefore *r* is the most appropriate effect size measure to represent these variables (Card, 2012; Cooper, 2010; Lipsey & Wilson, 2001).

Further, because the distribution of sample *r*s around a population is skewed, the *r* values were transformed to Fisher's *Z* (Z_r) for analyses. This transformation allows for better accuracy in combining and comparing effect sizes because a sample of Z_rs is symmetrically distributed around a population (Card, 2012). While Z_r was used to combine effect sizes, the Z_r values were transformed back to *r* for reporting purposes.

Model Estimation

A random-effects model was utilized for all analyses, which assumes the individual studies are representative of different populations and allows for both sampling error and variability in the population of effects (Card, 2012). Given the variety of the studies, using the fixed-effects model, which assumes all studies have the same true effect and that all of the variability in effect sizes among studies comes from sampling error, is not appropriate (Borenstein et al., 2010). The assumptions of a fixed-effect model are rarely met, and misuse of this model leads to underestimation of the standard error and confidence intervals (Field, 2003; Hunter & Schmidt, 2000).

Moderator Analyses[2]

Cochrane's *Q* statistic and the I^2 statistic are used to evaluate the amount of heterogeneity in the effect sizes and can be used to gauge the appropriateness of moderation analyses (Card, 2012). The *Q* statistics tests whether there is heterogeneity present; the I^2 index quantifies the magnitude of this heterogeneity (Card, 2012). After heterogeneity is assessed, moderation analyses can be utilized to help explain this variability. For the current study, moderation analyses were conducted to assess seven categorical variables. Moderation analyses for categorical moderators are analogous to the ANOVA.

Results

Descriptive Information

Major characteristics and outcomes of the studies comprising the meta-analysis are provided in Table 1. From the 34 samples (note that these come from 29 independent studies as effect sizes from separate samples in the same study were included as separate effect sizes), there was a grand total of 24,426 participants. The sample sizes ranged from roughly 135 to approximately 4,500. The mean sample size was 718 with a SD of 847.

[2] There was limited variability in CSRE type (most studies measured casual sex in general or hookups), and there were few studies that used any design besides cross-sectional. Due to the lack of reporting and/or variation across categories, no analyses could be conducted on these variables (i.e., CSRE type and design as well as relationship status, sexual orientation, and type of sexual behavior).

Table 1 Summary information and weighted effect sizes for studies included in meta-analysis

Study	Sample	M age in years (SD)	CSRE indicator—time frame	Alcohol use indicator—time frame	Method of collection; Sample notes	Weighted effect size (*r*+)	95 % Confidence Interval
Barriger and Vélez-Blasini (2013)	181 (31.7 % male); USA (college)	19.91 (N/A)	Other Number of hookups (Paul et al., 2000 definition)—past semester	Other Classified as abstainers, infrequent drinkers, light drinkers, moderate drinkers, and heavy drinkers) based on the Quantity-Frequency Variability index (Vélez-Blasini, 1997)—General/lifetime use	Online survey	.337	.201–.460
Brown and Vanable (2007)	380 (33 % male); USA (college)	18.90 (1.4)	Dichotomous Classified as non-steady partner ("person they knew, but not a steady partner" or "casual acquaintance or someone they just met") or steady partner ("boyfriend/girlfriend or steady partner")—most recent sexual experience	Other Number of drinks consumed—most recent sexual experience	Paper-and-pencil	.203	.106–.296
Clutterbuck et al. (2001)	479 (males); Scotland (community adult)	*30 (15–70)	Dichotomous Regular or casual partner—last sexual encounter	Dichotomous Consumed alcohol—last sexual encounter	Interview Homosexual sample	.171	.073–.266
Cousins et al. (2010)	362 (51 % male); Ireland (community adult)	23.9 (3.19)	Dichotomous Categorized partner as casual (Just met or knew each other but not steady) or steady—most recent sexual partner	Dichotomous Consumed alcohol – most recent sexual encounter	Interview (telephone)	.465	.372–.548
Dir et al. (2013)	611 (22.7 % male); USA (college)	21.4 (4.18)	Other Four item measure ("number of partners with whom one has engaged in: (1) Sex with only once; (2) oral sex with only once; (3) sex with an uncommitted partner; and (4) oral sex with an uncommitted partner") - lifetime	Composite AUDIT (binge drinking and frequency of alcohol-related problems)—current	Online survey	.280	.205–.352
Downing et al. (2011)	3,003 (51.88 % male); British, Spanish, German (community adult)	25.5 (*16–35)	Dichotomous Had sex with new partner—during holiday (past week)	Frequency Frequency of drunkenness—past week	Paper-and-pencil	.248	.138–.351

Table 1 continued

Study	Sample	M age in years (SD)	CSRE indicator—time frame	Alcohol use indicator—time frame	Method of collection; Sample notes	Weighted effect size (*r+*)	95 % Confidence Interval
Fielder and Carey (2010a)	138 (22 % male); USA (college)	18.03 (.18)	Dichotomous Number of casual partners (''someone whom you were not dating or in a romantic relationship with, and at the time of the sexual interaction, you understood that there was no mutual expectation of a romantic commitment''– past semester.	Other Peak intoxication level assessed by calculating peak blood alcohol content (BAC) based on the highest number of reported drinks consumed in a single session—past month.	Paper-and-pencil	.303	.143–.448
Fielder et al. (2013)	483 (females); USA (college)	18.10 (.3)	Other Number of hookups (performed oral sex, received oral sex, vaginal sex) with casual partner ("someone whom you were not dating or in a romantic relationship with at the time of the physical intimacy, and there was no mutual expectation of a romantic commitment. Some people call these hookups"– academic year	Frequency Frequency of binge drinking (four or more drinks on one occasion)—last month	Online survey	.114	.025–.201
Fortunato et al. (2010) (High school)	638 (45 % male); USA (adolescent)	16 (*9th through 12th graders)	Other Number of hook-ups [Never, had a hook-up with one person, had a hook-up with two people, had a hook-up with three or more people] (''A "hook-up is a sexual encounter with someone who is a stranger, brief acquaintance, or friend. The encounter is just a one-time event and may include just kissing or it may include other sexual activity.'')—lifetime	Frequency Frequency of drinking [Never had alcohol, 1–2 occasions, 3–5 occasions, 6–9 occasions, 10–19 occasions, 20–39 occasions, 40 or more occasions]—lifetime	Online survey Mixed race sample	.348	.278–.414
Fortunato et al. (2010) (Middle school)	362 (45 % male); USA (adolescent)	13 (*7th and 8th graders)	Other See above	Frequency See above	See above	.301	.204–.392
Garneau et al. (2013)	881 (30 % male); USA (college)	19.4 (1.33)	Dichotomous Did or did not hookup (penetrative or non-penetrative) "Some people say that a 'hookup' is when two people get together for a physical encounter and don't necessarily expect anything further (e.g., no plan or intention to do it again)—past year	Frequency Frequency of heavy episodic drinking (had five or more drinks on one occasion)—past 30 days	Online survey	.450	.396–.501

Table 1 continued

Study	Sample	M age in years (SD)	CSRE indicator—time frame	Alcohol use indicator—time frame	Method of collection; Sample notes	Weighted effect size ($r+$)	95 % Confidence Interval
Graves (1995) (females)	136 (females); USA (community adult)	24.3 (N/A)	Dichotomous Categorized partner as casual (i.e., someone just met, friend or acquaintance) or committed (steady boy/girlfriend, fiancé/spouse)—Most recent new sexual partner	Dichotomous Did or did not drink—most recent sexual encounter	Mixed methods (interview for alcohol, paper-and-pencil for CSRE)	.472	.317–.602
Graves (1995) (males)	149 (males); USA (community adult)	24.3 (N/A)	Dichotomous see above	Dichotomous see above	See above	.533	.391–.650
Graves and Hines (1997) (females)	415 (females); USA (community adult)	*25.5 (18–33)	Dichotomous Categorized partner as casual (i.e., someone just met, friend or acquaintance) or committed (steady boy/girlfriend, fiancé/spouse)—Last sexual partner	Dichotomous Did or did not drink—Last sexual encounter	Mixed methods (interview for alcohol, paper-and-pencil for CSRE) Mixed race sample	.357	.257–.449
Graves and Hines (1997) (419 Males)	419 (males); USA (community adult)	*25.5 (18–33)	Dichotomous See above	Dichotomous see above	see above	.433	.336-.520
Gute and Eshbaugh (2008)	241 (21.86 % male); USA (college)	19.42 (1.71)	Dichotomous Number of hookups (Paul et al., 2000 definition)—lifetime.	Frequency Frequency of alcohol use [don't drink, less than once a year, 1–5 times, 6–11, once a month, 2–3 per month, 1 a week, 2–3 times a week, 4–6 times a week, daily]—general/lifetime.	Paper-and-pencil	.290	.170–.402
Johnson (2013)	4,594 (48.7 % male); USA (community adult)	28.39 (1.79)	Other Did or did not hookup ("Considering all types of sexual activities, whit how many partners, male or female, have you had sex on one and only one occasion?" - lifetime	Frequency Number of days drank alcohol—past 12 months	Paper-and-pencil	.203	.175–.231
Justus et al. (2000)	410 (gender distribution unknown); USA (college)	20.66 (1.87)	Other Number of one-night stands (no definition given)—past year.	Composite Frequency, quantity, density - past 6 months	Paper-and-pencil	.240	.147–.329
LaBrie et al. (2014)	804 (33 % male); USA (college)	20.08 (1.59)	Dichotomous Had or did not hookup ("Engaging in behaviors ranging from kissing to sexual intercourse with someone with whom you do not have a committed relationship.'')—past year.	Dichotomous Classified as drinkers or non-drinkers based on frequency, quantity, and heavy drinking—past month.	Online survey Mixed race sample	.419	.347–.486

Table 1 continued

Study	Sample	M age in years (SD)	CSRE indicator—time frame	Alcohol use indicator—time frame	Method of collection;Sample notes	Weighted effect size (*r+*)	95 % Confidence Interval
Lewis et al. (2014a)	759 (42 % male); USA (college)	19.9 (1.52)	Other Frequency of casual sex ("sexual partner with whom you are not in a committed relationship; someone you just met")—past 3 months	Composite Frequency consuming alcohol before or during sexual encounters, Typical number of drinks prior to sex—past 3 months	Online survey	.203	.134–.270
Lewis et al. (2014b)	485 (46.1 % male); USA (college)	20.3 (1.50)	Other Frequency of casual sex—Spring Break	Composite Number of drinks, frequency of drinking before sex, number of drinks prior to sex—Spring Break	Online survey	.290	.206–.369
Lyons (2009)	973 (47.6 % male); USA (community adult)	20.4 (17)	Other Number of casual sex partners ["How many different people of the opposite sex have you had vaginal sex (oral sex) with that you weren't really dating or going out with?"]—lifetime.	Frequency Frequency of drinking (never to more than once a day)—past 24 months	Interview	.600	.558–.639
Manthos, Owen, and Fincham (2013)	339 (32.74 % male); USA (college)	19* (18–23)	Dichotomous Group based on hookup status ["when two people get together for a physical encounter and don't necessarily expect anything further (e.g., no plan or intention to do it again)."]—past 10 weeks.	Composite (quantity, frequency, heavy drinking)—past month	Online survey	.352	.259–.439
Olmstead, Pasley, and Fincham (2013)	412 (males); USA (college)	19.4 (1.33)	Dichotomous Did or did not hookup ["when two people get together for a physical encounter and don't necessarily expect anything further (e.g., no plan or intention to do it again)"]—past 4 months	Composite (frequency and quantity)—past month.	Online survey Longitudinal	.240	.147–.329
Owen and Fincham (2011a)	889 (38.36 % male); USA (college)	19* (17–25)	Dichotomous Had or did not have friends with benefits relationship [''a friendship in which there are also physical encounters, but no on-going committed relationship (e.g., not boyfriend/girlfriend)."]—past year.	Composite (frequency, quantity, heavy drinking)—past month	Online survey	.330	.270–.387

Table 1 continued

Study	Sample	M age in years (SD)	CSRE indicator—time frame	Alcohol use indicator—time frame	Method of collection; Sample notes	Weighted effect size ($r+$)	95 % Confidence Interval
Owen, Rhoades, Stanley, and Fincham (2010) (females)	560 (females); USA (college)	20 (2.85)	Dichotomous Did or did not hookup ("an event in which two people are physically intimate outside of a committed relationship without the expectation of future encounters.")– past year.	Composite using Alcohol Use Disorders Identification Test (frequency and quantity)—general/lifetime	Online survey	.540	.479–.596
Owen, Rhoades, Stanley, and Fincham, (2010) (males)	240 (males) USA (college)	See above	Dichotomous See above	Composite See above	See above	.510	.410–.598
Owen, Fincham, and Moore (2011)	394 (23.6 % male); USA (college)	19 (N/A)	Dichotomous Did or did not hookup ("when 2 people get together for a physical encounter and don't necessarily expect anything further (no plan or intention to do it again)—Past semester	Composite (quantity, frequency, and heavy drinking)—past month.	Online survey	.511	.439–.575
Paul et al. (2000)	555 (37.5 % male); USA (college)	21.5 (N/A)	Dichotomous Did or did not hookup ("Sexual encounter usually lasting one night between 2 people who are strangers or brief acquaintances. May or may not include intercourse.")—lifetime	Other Alcohol intoxication symptomology (Rated how often experience 11 intoxication symptoms such as blurred vision, difficulty walking)—general/lifetime	Paper-and-pencil	.315	.240–.386
Scott-Sheldon et al. (2012)	1,151 (73 % male); South Africa (community adult)	31.61 (8.54)	Dichotomous Categorized partners as primary/main ("someone you have a relationship with") or casual ("non-regular")—past month	Dichotomous Categorized as heavy or non-heavy drinkers (heavy if engaged in heavy drinking "5 or more drinks on an occasion" at least once a week)—past month	Paper-and-pencil Predominately Black sample	.069	.004–.134
Træen and Lewin (1992) (females)	982 (females); Norway (adolescent)	18*(17–19)	Dichotomous Has had casual sex ("Have you ever had sexual intercourse with a person you met for the first time the same night as the intercourse took place?")—lifetime	Frequency Frequency of alcohol consumption—past month	Paper-and-pencil	.310	.252–.365
Træen and Lewin (1992) (males)	843 (males) Norway (adolescent)	See above	Dichotomous See above	Frequency See above	See above	.400	.342–.455

Table 1 continued

Study	Sample	M age in years (SD)	CSRE indicator—time frame	Alcohol use indicator—time frame	Method of collection; Sample notes	Weighted effect size ($r+$)	95 % Confidence Interval
Vollrath and Torgersen (2002)	683 (46.4 % male); Norway (college)	24.8 (3.5)	Dichotomous Has had a one-night stand (no definition provided)—past 3 months	Other Quantity (number of glasses of beer wine and spirits consumed on average per week)—lifetime/general	Paper-and-pencil	.170	.096–.242
Wilton (2008)	475 (males); USA (community adult)	33.7 (9.41)	Dichotomous Categorized partner as primary sex partner or casual sex partner(s)—past year.	Dichotomous Used alcohol before sex—past year.	Paper-and-pencil Predominately Black sample	.229	.134–.320

Age range presented when mean not available

In general, the studies comprising this meta-analysis varied regarding their conceptualization of CSREs as well as alcohol use (see Table 1). Furthermore, studies with non-college participants and studies conducted outside of the United States were underrepresented in the current literature. Sexual orientation information was also underreported in the current literature. The majority of the studies did not report any information on the participant's sexual orientation and within the studies reporting this information only three included a sample of non-heterosexual individuals larger than 6 %.

Weighted Mean Effect

A weighted mean effect size was calculated in order to provide an estimate of the overall effect size. The mean effect size was calculated by summing the weighted effect sizes and dividing this number by the sum of the inverse variance weights (see Card, 2012). Weighted effect sizes for each individual study are presented in Table 1. Figure 2 shows the forest plot which visually presents information regarding the association between alcohol use and CSRE engagement for each study with the boxes depicting each study proportional to the study's weight.

Overall, the weighted mean effect size ($r+$) was .34 with a 95 % confidence interval from .29 to .38. This correlation significantly differed from zero ($Z = 12.62$, $p < .001$). Specifically, the overall mean effect suggests that higher levels of alcohol use are associated with higher levels of CSRE engagement. Specifically, this result suggests that approximately 11.22 % (r^2) of the variability in CSRE engagement was explained by alcohol use. According to Cohen's effect size guidelines, values of .10 are considered small, values of .30 are considered medium, and values of .50 and above are considered large (Cohen, 1969). Therefore, the overall mean effect in this study represents a medium effect.

Effect Size Heterogeneity

Following these initial analyses, we tested for effect size heterogeneity using the heterogeneity test (i.e., Q statistic) and quantified this heterogeneity using the I^2 index. Specifically, the Q statistics tests whether there is heterogeneity present; the I^2 index quantifies the magnitude of this heterogeneity (Card, 2012). The I^2 statistic represents the percent of the dispersion due to real dispersion, or the "true" dispersion in the effects (Borenstein et al., 2010; Card, 2012).

For the current study, Q (34) = 480.32, $p < .001$. This significant finding suggests there is variability around the mean effect such that some studies find larger effects and some find smaller effects (Card, 2012). For the current study $I^2 = 93.13$ %. The high value of I^2 suggests a large proportion of the variability in the effect sizes is due to true differences between studies rather than simple random sampling error (Borenstein et al., 2010; Higgins,

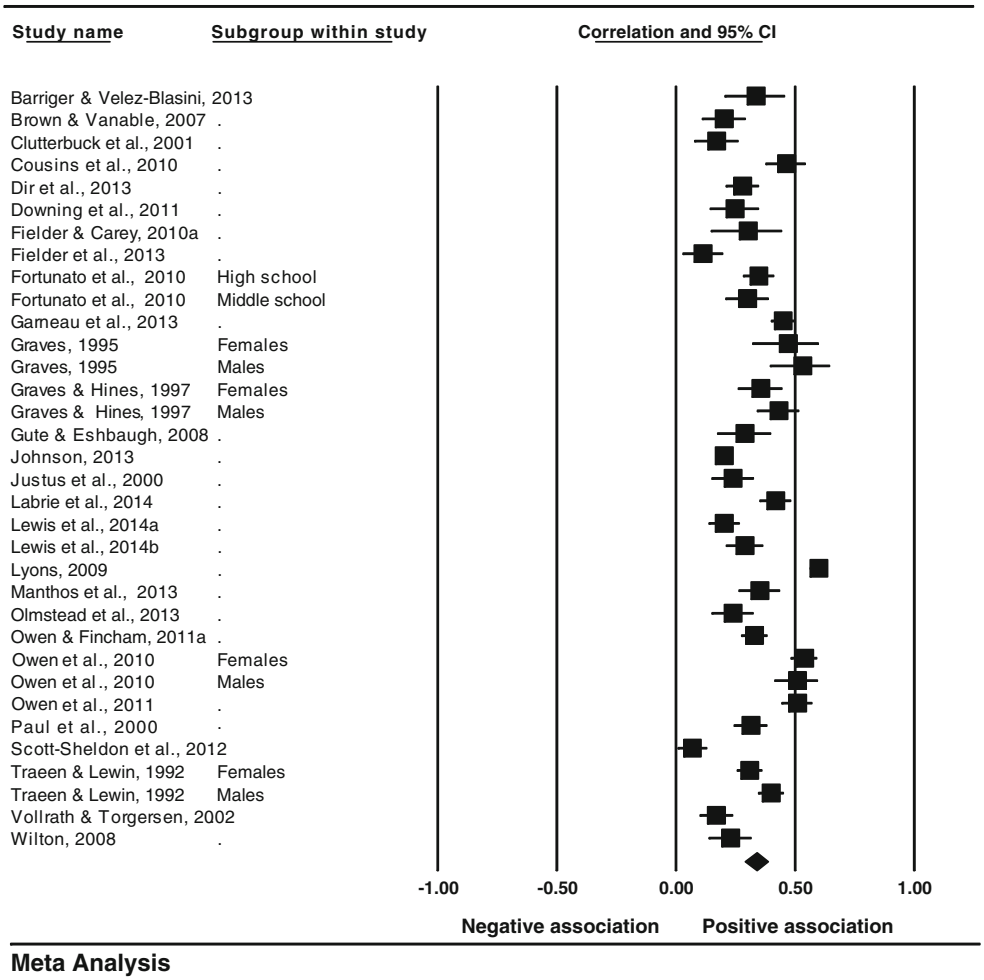

Fig. 2 Forest plot of the studies used in the meta-analysis and the weighted point estimates

Table 2 Results of demographic moderation analyses

Moderator	Between group Q	Levels	k	Q	$r+$	95 % CI
Age	11.12**	≤18	6	30.47	.300	.219–.377
		18–24	20	225.66	.384	.322–.443
		≥25	8	47.76	.230	.163–.296
Population	.14	College	19	177.29	.326	.267–.382
		Community adult	11	282.18	.350	.231–.459
Gender	.35	>60 % female	16	116.29	.353	.296–.408
		Mixed	9	222.76	.322	.208–.427
		>60 % male	8	103.88	.326	.205–.437
Country	2.13	US	27	377.12	.353	.297–.405
		Other	7	85.33	.265	.156–.368

Between group Q = moderation is significant if this value is significant; k = number of studies included in each outcome; $r+$ = weighted effect size; 95 % CI = 95 % confidence interval of the weighted mean effect size

$^{+}$ $p < .10$; $^{*}p < .05$; $^{*}p < .01$; $^{***}p < .001$

Thompson, Deeks, & Altman, 2003). Overall, these results support the assumption that there was both between and within sample variance and verify the appropriateness of the random-effects model.

Moderator Analyses

Guided by these initial findings of heterogeneity, moderation analyses were implemented to evaluate variables potentially affecting the

Table 3 Results of moderation analyses examining methodological factors

Moderator	Between group Q	Levels	k	Q	$r+$	95 % CI
CSRE measurement	.79	Dichotomous	24	242.07	.350	.295–.402
		Other	10	214.44	.298	.195–.395
Alcohol measure	4.06	Dichotomous	9	105.30	.351	.235–.457
		Composite	10	95.71	.354	.273–.430
		Frequency	10	250.55	.335	.232–.431
		Other	5	10.65	.257	.183–.327
Method	6.32*	Paper and pencil survey	12	75.67	.247	.193–.300
		Online survey	15	137.61	.353	.290–.413

Between group Q = moderation is significant if this value is significant; k = number of studies included in each outcome; $r+$ = weighted effect size; 95 % CI = 95 % confidence interval of the weighted mean effect size

$^{+}$ $p \leq .10$; $^{*}p \leq .05$;$^{**}p \leq .01$; $^{***}p \leq .001$

strength of the association between alcohol use and engagement in CSREs. Table 2 shows the results examining the demographic/sample specific variables in the relationship between alcohol use and CSRE engagement. Table 3 shows the same statistics for the methodological moderators.

Age

Age (based on mean sample age) was categorized as less than or equal to 18, 18–24, and greater than 24. Analyses revealed that these categories were significantly different ($Q_B[2] = 11.12, p = .004$). Follow up analyses revealed a significant difference between younger and older adults such that studies with an average age of 18–24 had greater effect sizes than studies with a higher mean age and marginally significant differences between adolescent samples and samples ages 18–24 such that studies with an average age of 18–24 had greater effect sizes. Results revealed no significant differences between adolescent samples and samples of older adults. After controlling for this moderator, the variability within each of the groups (Q_w) was still significant.

Population

As opposed to focusing on the sample's mean age, the population variable focuses on where participants were recruited (colleges versus community samples). Results of the current meta-analysis revealed no significant differences between college samples and community adult samples. Four effects from adolescent samples were excluded from this analysis.

Gender

Table 2 also shows results examining gender as a moderating variable in the relationship between alcohol use and CSRE engagement. One study (Justus, Finn, & Steinmetz, 2000) was excluded from this analysis due to lack of information regarding the gender distribution of this sample. Overall, the Q_B statistic revealed that the relationship was not significantly different at the levels of gender inclusion (>60 % female, >60 % male, or mixed). Additional analyses revealed that there were no significant differences between all female ($k = 5$, $r = .36$, 95 % CI = .21–.50) and all male samples ($k = 7, r = .36, 95\,\%$ CI = .26–.45) ($Q_B(1) = .002$, $p = .96$).

Country

Analyses also revealed a trend in the magnitude of effect for studies conducted in the United States and studies conducted in other countries ($Q_B[2] = 2.13, p = .15$). These results revealed studies in the United States had a larger effect size than studies conducted outside of the United States. After controlling for this moderator, the variability within each of the groups (Q_w) remained significant.

CSRE Measurement

While studies varied considerably regarding the way they measured CSRE engagement, a majority of the studies artificially dichotomized this measure. As such, this variable was re-categorized as dichotomous or other. Moderation analyses revealed no significant differences based on the CSRE measurement.

Alcohol Measurement

Analyses revealed no significant differences based on alcohol measurement (dichotomous, composite, frequency, other).

Method

Due to a low number of studies which utilized interviewing techniques ($N = 3$) analyses were run comparing online and paper-and-pencil measures. Two studies (Graves, 1995; Graves & Hines, 1997) were also excluded because they used mixed methods

(interview for alcohol but paper-and-pencil for sexual behaviors). Analyses revealed a significant difference in method, $Q_B(1) = 6.32$, $p = .01$. Specifically, online studies had greater effect sizes than studies utilizing paper-and pencil-methods. After controlling for this moderator, the variability within each group (Q_w) was still significant.

Study Quality

Analyses revealed no significant differences between studies that reported acceptable reliability for the alcohol measure ($k = 9$) and those that did not report reliability information ($Q_B[1] = 1.81$, $p = .18$). Unfortunately, most studies did not report any information about the reliability of the CSRE measurement (number reporting = 2). Few studies reported information regarding validity for alcohol use or CSRE engagement ($k < 5$ for both). Given that there are no set standards for CSRE measurement in the field, CSRE quality is particularly difficult to evaluate.

Publication Bias

Measures were taken to correct for publication bias (e.g., the idea that published studies tend to have larger effect sizes than unpublished studies) and related small-study effects (e.g., smaller studies tend to have larger effect sizes than larger studies) (Borenstein, 2005). Specifically, we examined Rosenthal's classic failsafe *N* (Rosenthal, 1979), Orwin's failsafe *N* (Orwin, 1983), funnel plots, trim and fill analyses, Kendall's Tau, and cumulative analyses assessing each study's impact on the overall mean. For the current meta-analysis the failsafe *N* was 7,644, suggesting there would need to be over 7,000 studies with non-significant results in order to nullify the results of the current meta-analysis. This number falls well over the tolerance level, which is 180 ($5k + 10$ with k equal to 34) for the present study. Furthermore, Orwin's failsafe *N* is 147, assuming an average correlation of .05. Explicitly, 147 missing studies with low correlations (.05) would be needed to bring the average correlation to below .1. Both the classic failsafe *N* and Orwin's failsafe *N* suggest a large number of unpublished studies with null or small effects would be needed to trivialize the results of the current meta-analysis.

Funnel plots further support this conclusion. Visual inspection of the funnel plot revealed slight asymmetry in the upper portion of the plot. As the asymmetry occurred at the upper right hand portion of the plot, rather than the bottom as expected with publication bias, this poor fit is probably due to imprecise measurement in the outcome as opposed to true publication bias (Sterne & Harbord, 2004). Trim and fill analysis revealed limited evidence of bias (see Duval & Tweedy, 2000a, b). Using a random-error model, two potential missing effect sizes were identified. Imputing values for these studies would actually increase the mean correlation to $r+ = .350$ (95 % CI = .298–.399), which is still a medium and statistically significant effect. Because this adjusted estimate is close to the original estimate of .34 and in this context the two have similar implications, the trim and fill analysis suggests publication bias did not substantially alter the results.

Finally, results of two methods examining the association between study size and effect size revealed no evidence of bias. Begg and Mazumdar's rank correlation (Kendall's tau) was .12 ($p = .34$). This non-significant result suggests that high standard errors were not associated with larger effect sized (i.e., small studies did not have significantly larger effect sizes than larger studies). Similarly, the cumulative meta-analysis results showed that including smaller studies did not shift the point estimate. Power may be low for estimating Kendall's tau (Card, 2012), but when taken together the results of these various methods of assessing publication bias suggest it is improbable that publication bias significantly impacted the findings of the current meta-analysis. However, it is important to note that there were not many small studies included in the meta-analysis (the lowest sample size is 136). As such, publication bias cannot be ruled out entirely.

Discussion

Results of the current meta-analysis support the overall hypothesis that alcohol use is positively associated with CSRE engagement. We found that approximately 11.22 % (R^2) of the variability in CSRE engagement can be attributed to alcohol use. These results extend previous research by providing a more accurate estimate of this effect as well as assessing the variability in this finding. Specifically, the current meta-analysis revealed significant variability in the effect between alcohol use and CSRE engagement. The moderating variables examined in this study partially explained the variability in effect size. The demographic variables age and the methodological variable method of assessment moderated the association between alcohol use and CSRE engagement.

Results suggest age is associated with the magnitude of the effect such that the relationship between alcohol use and CSRE engagement is smaller for older adult samples than for emerging adult samples. This lends support to the idea that transitioning into adulthood—particularly college—is not only associated with heavy drinking and high rates of CSRE engagement (see Schulenberg & Maggs, 2002), but also increases the association between alcohol use and CSRE engagement. O'Malley (2004) further suggests that beginning employment and becoming financially independent are some of the reasons for a decline in heavy drinking in later adulthood, which may also explain why this association decreases in the late 20s.

This study found no significant differences between studies conducted using college and non-college samples. However, the majority of the studies sampled from college populations. Further, the samples of community adults did not explicitly exclude individuals in college; rather these were samples of adults that were not recruited from college campuses. Of the samples of community adults, all but one still included college students in

the sampling. As such, this did not represent a pure test of these different populations which may explain the null finding.

There was no indication of a gender difference in the association between alcohol use and CSRE engagement. Effect sizes did not differ based on the proportion of males in the sample. Furthermore, there were no significant differences between all male and all female samples. As such, it appears that the association between alcohol use and CSRE engagement does not differ for men and women.

On the other hand, there was a trend indicating higher effect sizes for studies conducted in the United States indicating higher effect sizes for studies conducted in the United States. While this effect is only a trend, it represented a meaningful difference (the correlations for the two groups differed by roughly .10). Discrepancies in sexual permissiveness between the United States and the European countries where most of the non-United States studies were conducted (e.g. Ireland, Norway) may explain this trend (Widmer, Treas, & Newcomb, 1998). The United States is somewhat unique in that it has relatively restrictive sexual attitudes in relationship to the amount of sexual content in its media (see Aubrey, 2004; Reichert, 2007; Widmer et al., 1998). Because the United States is less sexually permissive but has a highly sexualized media, alcohol use may be a way for individuals to justify their sexual behavior. Alternatively, alcohol use may make the social repercussions of CSRE engagement less salient. Importantly, this variable was dichotomized and further research is needed to test for specific differences across countries.

Method of data collection significantly moderated the link between alcohol use and CSRE engagement. Studies utilizing online surveys gleaned greater effects than paper-and-pencil surveys. While in general studies have found limited or small differences between paper-and-pencil and computerized measures (e.g., Dwight & Feigelson, 2000; Richman et al., 1999), there is evidence that when individuals are reporting on especially sensitive topics such as alcohol consumption and risky sexual behaviors, responses to computerized surveys are less biased than paper-and-pencil measures (e.g., Booth-Kewley, Larson, & Miyoshi, 2007). Booth-Kewley et al. suggest computer surveys create an "anonymous, impersonal social situation that produces a sense of disinhibition in respondents" (p. 471). While we were unable to test for differences between interviews and these other measures, research generally finds interview methods produce more social desirability effects than other methods potentially because self-administration provides more anonymity (see Richman et al., 1999 for meta-analysis and Tourangeau & Yan, 2007 for a review).

Overall, the current meta-analysis found evidence of moderation (specifically that age and method of data collection were significant moderators of the association between alcohol use and CSRE engagement and that country was a marginally significant moderator of this relationship). However, it is important to note that we were unable to examine several potential moderators (romantic relationship status, sexual orientation, type of sexual behavior, design, and CSRE type) due to limited variability and/or underreporting of these variables. This suggests further research needs to incorporate more diverse samples and designs as well as use more consistent terminology regarding CSRE types.

Limitations of the Current Study

The present results should be interpreted with caution in light of some limitations. While the meta-analytic technique has a number of strengths, all meta-analyses are limited by the available literature. For example, all of the current studies relied on self-report measures for alcohol use and CSRE engagement. While more objective measures are difficult to implement, it is important to recognize that data with a reliance on a single technique is limited. For example, research suggests studies of sexual behaviors are prone to participation biases as well as underreporting and recall biases (see Fenton, Johnson, McManus, & Erens, 2001 for a review). Furthermore, the existent literature suggests women may be especially prone to bias for self-reported sexual behaviors due to more restrictive views regarding acceptable behaviors for women (Alexander & Fisher, 2003). Alcohol use is also a behavior that is susceptible to social desirability bias (Embree & Whitehead, 1993). Consequently, there may be bias in reporting for both alcohol use and CSRE engagement.

Publication bias is also a potential threat to all meta-analyses given that non-significant findings tend not to be published (Card, 2012). In the current study, there was little evidence of selective publication of studies. However, it is impossible to fully rule out publication bias as a potential problem for any meta-analysis, including the current one. Given that studies that did not provide sufficient statistical information (and whose authors did not respond to requests for information) were excluded from the present analysis. Furthermore, there was substantial variability in effect size. Consequently, the association between alcohol use and CSRE engagement may be overstated.

Conclusions and Implications

Overall this meta-analysis confirms alcohol use is importantly associated with CSRE engagement. Furthermore, this study found that age and method of data collection significantly moderated this effect. These findings advance understanding in the field by providing an estimate of the average effect size between alcohol use and CSRE engagement. Given that this meta-analysis has established a relationship between CSRE engagement and alcohol use, the next step for research is to develop a model testing the theoretical associations among these variables and to examine the mediating factors that may lead to the association between these two variables.

Importantly, the current meta-analysis has several implications for future research on CSRE engagement and alcohol use.

In particular, this meta-analysis draws attention to the need for a more comprehensive and consistent study of CSRE engagement and alcohol use, for the use of diverse methods (including longitudinal studies), and for research outside of homogenous college populations.

While this meta-analysis is an important step in establishing a link between alcohol use and CSRE engagement, the use of cross-sectional designs in the current literature makes it impossible to infer causality. It may be, for example, that drinking leads to engaging in CSREs (for example alcohol consumption may make individuals of the opposite sex appear more attractive; Jones, Jones, Thomas, & Piper, 2003), that individuals who engage in CSREs are more apt to drink, or that some third variable (e.g., lifestyle factors, propensity for risk taking, and/or impulsivity) explains the association between drinking and CSRE engagement. Unfortunately, none of these potential explanations can be fully examined based on the current literature. Additionally, a number of studies examined lifetime sexual partners and general alcohol use. These global-level associations do not provide evidence for a causal or even a temporal link. Event-level studies lend some evidence to the idea that alcohol may precede sexual activity in a given instance (e.g., Parks, Hsieh, Collins, & Levonya-Radloff, 2011), but this research is not conclusive. Experimental designs may also help determine the causal connections between alcohol use and intentions to engage in CSREs (see Rehm et al., 2012 for a meta-analysis of experimental association between alcohol consumption and intentions to engage in unprotected sex). To fully understand the link between alcohol use and actual CSRE engagement, however, there is a need for innovative designs including event level designs and studies with longitudinal components that build on the knowledge from the studies reviewed in the current meta-analysis.

Overall, the current study has important implications in terms of prevention and intervention efforts. The main finding of a moderate association between CSRE engagement and alcohol use suggests efforts aimed at preventing negative CSRE effects such as depression, low self-esteem, and the spread of STIs should focus on individuals prone to experience alcohol problems. While this study is not conclusive regarding the causal relationship between alcohol use and CSRE engagement, prevention efforts aimed at alcohol use could prove beneficial regardless of if alcohol use itself prompts CSRE engagement or if alcohol use serves as an indicator of other factors that lead to CSRE engagement.

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