Risky sexual behavior and substance use among adolescents: A meta-analysis

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ABSTRACT

This study presents the results of a meta-analysis of the association between substance use and risky sexual behavior among adolescents. 87 studies fit the inclusion criteria, containing a total of 104 independent effect sizes that incorporated more than 120,000 participants. The overall effect size for the relationship between substance use and risky sexual behavior was in the small to moderate range ($r = .22$, CI $= .18, .26$). Further analyses indicated that the effect sizes did not substantially vary across the type of substance use, but did substantially vary across the type of risky sexual behavior being assessed. Specifically, mean effect sizes were the smallest for studies examining unprotected sex ($r = .15$, CI $= .10, .20$), followed by studies examining number of sexual partners ($r = .25$, CI $= .21, .30$), those examining composite measures of risky sexual behavior ($r = .38$, CI $= .27, .48$), and those examining sex with an intravenous drug user ($r = .53$, CI $= .45, .60$). Furthermore, our results revealed that the relationship between drug use and risky sexual behavior is moderated by several variables, including sex, ethnicity, sexuality, age, sample type, and level of measurement. Implications and future directions are discussed.

1. Introduction

Sexually transmitted infections (STIs) represent one of the most critical public health challenges facing our nation, as there are approximately 19 million new infections within the United States each year, resulting in a yearly cost to our healthcare system of approximately $17 billion (Centers for Disease Control and Prevention [CDC], 2011). Globally, over a million people each day are infected with a STI (World Health Organization [WHO], 2013). The study of adolescents' sexual behavior has been a mainstay in the infectious disease literature for over three decades (Martinez, Copen, & Abma, 2011; Sawyer, Afifi, Bearinger, et al., 2012), as adolescents in the United States comprise approximately 50% of all new STI cases (Weinstock, Berman, & Cates, 2004) and 60% of youth worldwide are currently infected with a STI (Da Ros & Schmitt, 2008). Growth in the rates of STIs and associated costs of infection has created a sense of urgency in the need to understand the individual and situational factors that increase one's risk for infection. One such factor, substance use prior to sexual activity, has

been commonly shown to increase the likelihood of unsafe sexual intercourse (e.g., Yan, Chiu, Stoesen, & Wang, 2007). Though many studies have examined the relationship between risky sexual behavior (RSB) and substance use (SU) within a number of adolescent populations and within a variety of settings, the results of study findings have been mixed (e.g., Bryan, Ray, & Copper, 2007; Siahaan, 2006; Voisin, Crosby, Yarber, Salazar, & DiClemente, 2007). Therefore, the purpose of the current study is to use meta-analytic techniques to determine the conditions under which the relationship between these two variables is strongest. Specifically, we seek to estimate the average relationship between SU and RSB in adolescents, as well as to understand how the strength of this relationship varies with type of substance use, type of RSB being considered, and sample characteristics.

1.1. Substance use and risky sexual behavior

There is evidence that as many as 22.1% of adolescents engaged in SU during their most recent sexual encounter (e.g., Eaton et al., 2012). Research has shown that, relative to their non-substance using peers, adolescents who regularly abuse substances are more likely to become sexually active at an earlier age (e.g., Madkour, Farhat, Halpern, Godeau, & Gabhainn, 2010), have more sexual partners (e.g., Connell, Gilreath, & Hansen, 2009), and are more likely to have unprotected sex (e.g., Tucker, Ryan, Golinelli, et al., 2012). Furthermore, SU has

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been associated with increased risk of STI (e.g., Swartzendruber, Sales, Brown, DiClemente, & Rose, 2013), particularly among juvenile detainees (e.g., Valera, Epperson, Daniels, Ramaswamy, & Freudenberg, 2009).

Although many studies have provided evidence for a relationship between SU and RSB, the findings from studies investigating this relationship have been mixed. Some researchers have found that the two variables are positively related (e.g., Baskin-Sommers & Sommers, 2006; Bryan et al., 2007), while others have found no relationship between SU and RSB (e.g., Leigh et al., 2008; Voisin et al., 2007). Several studies have important methodological variations that could have influenced their results, making generalizations difficult (e.g., Ellickson, Collins, Bogart, Klein, & Taylor, 2005). For the purposes of this study, RSB is defined as any behavior that increases one's likelihood of STI, including having unprotected intercourse, having multiple sexual partners, and having intercourse with an intravenous drug user (IVDU). Substance use, on the other hand, includes the global or frequency of alcohol use and prescription drug abuse, as well as the use of illicit substances such as marijuana, cocaine, opiates, and ecstasy.

1.2. Explanations of the relationship between substance use and risky sex

The perception that SU has a disinhibiting effect on one's decision to engage in sexual behavior is widely accepted (Yan et al., 2007). Research on neurocognition suggests that these effects may be particularly strong for adolescents. The areas of the brain responsible for the experience of pleasure, emotion, reward, and novelty seeking reach maturity prior to areas of the brain that are associated with behavior regulation and higher-order processing (Riggs & Greenberg, 2009). Researchers have found that the limbic system, which is responsible for emotion control, develops significantly earlier than the frontal cortex, which controls executive functioning, such as decision making (Casey, Getz, & Galvan, 2008). Since the frontal cortex is still developing during adolescence, youth commonly make decisions that are disproportionately influenced by emotion rather than reasoning, increasing the likelihood of engaging in risky behaviors (e.g., Steinberg, 2008). Furthermore, previous research has suggested that type of SU may be differentially associated with certain types of RSB. One study, for example, found that marijuana use, and not alcohol use, was associated with RSB (Kingree & Betz, 2003).

Other theories suggest that the relationship between SU and RSB may not be entirely based in biology. Steele and Josephs (1990) proposed the alcohol myopia theory, suggesting that the disinhibition of behavior is the result of a reduction in the ability to correctly extract meaning from situational cues. Similarly, Hull and Bond (1986) proposed the expectancy theory, which suggests that if adolescents expect SU to have a disinhibiting impact on their sexual behavior, they are more likely to engage in risky behaviors that have been attributed to SU, such as unprotected sex.

Some researchers believe that instead of SU leading to RSB, the practice of RSB leads to SU (Cooper, 2006). According to Cooper (2006), when the opportunity for intercourse arises, an individual's motivations to engage in RSB lead him or her to use substances. Adolescents might also engage in SU because they believe that it has the potential to enhance their sexual experiences (Matthews et al., 2013). Individuals may sometimes attempt to excuse (to oneself and others) their behavior, such as RSB, by attributing it to the effects of SU (Cooper, 2006). Regardless of the individual motivations, reverse causal explanations assume that people strategically use substances because they believe that SU has the potential to facilitate the desired behaviors that lead to the sought after sexual outcome (Hendershot, Magnan, & Bryan, 2010).

Aside from explanations that focus on biological development or influences and individual expectations, research has shown that other factors may further influence the relationship between SU and RSB. Third-variable interpretations, for example, often focus on the characteristics of individuals or contexts that might increase the likelihood of both SU and RSB. Some individual characteristics that might be associated with both SU and RSB would be sensation seeking and impulsivity (Charnigo et al., 2013), and depression (e.g., Shrier, Schillinger, Aneja, et al., 2009). Some contextual factors that might be associated with SU and RSB would be abuse, neglect, parental SU, and peer influences (Cooper, 2006). All third-variable interpretations assume that the covariation between SU and RSB is due to a mediating variable, or the impact of a shared underlying cause.

1.3. Categorical differences between studies

There are several study characteristics that may moderate strength of the relationship between SU and RSB. We divided these into three categories: sample characteristics, measurement factors, and publication characteristics.

1.3.1. Sample characteristics

There is reason to believe that the relationship between SU and RSB may vary by demographic factors, such as sex (Schuster, Mermelstein, & Wakschlag, 2012) and ethnicity (Khan, Berger, Wells, & Cleland, 2012). Sex and ethnic differences often have cultural components that could lead to a significant amount of variability in concurrent participation in SU and RSB (Schwartz, Unger, Rosiers, et al., 2012). Sex differences in the relationship between SU and RSB may depend on age (SAMSA, 2009). Male and female adolescents (12–17 years old) reported similar rates of alcohol use (14.2% and 15%, respectively), while emerging adult males (18–24 years old) reported significantly more alcohol use (64.3%) than their female peers (58%). We would expect that, as youth get older, sex differences in the relationship between SU and RSB will be more pronounced, with males reporting stronger associations than their female peers. Furthermore, it is possible that there are ethnic differences in the degree of substance use or substance of choice (Substance Abuse Mental health Services Administration (SAMHSA) [SAMSA], 2009). According to data from the 2008 National Household Survey on Drug Abuse (NHSDA), Caucasian, Hispanic, and multiracial adolescents reported the highest rates of current alcohol use (16.3%, 14.8%, and 13.6%, respectively) (SAMSA, 2009). We propose that youth reporting the highest rates of SU may also be more likely to pair SU with RSB.

The setting from which participants are selected is an important factor as well. Voisin et al. (2007) found strong and significant relations between SU and RSB among juvenile detainees. Brown and Vanable (2007), on the other hand, did not find a significant relationship between SU and RSB among youth in community settings. It is possible that juvenile detainees differ significantly from their same-age peers who are not detained with regard to their desire to participate in risky behaviors and the degree to which they would pair illicit SU with RSB. Nationality of the sample could also be a source of variation in the reported relationship between SU and RSB (e.g., Cavazos-Rehg et al., 2011; Kebede, Alem, Mitike, et al., 2005). The customs and behavioral expectations of citizens of some countries might make concurrent SU and RSB more or less likely.

1.3.2. Measurement factors

One of the most significant differences between studies of the relationship between these two variables is the variability in the operationalization of both substance use and risky sexual behavior, making comparisons between single studies difficult. The relationship between SU and RSB is often measured in one of three ways: globally, at the situational, or at the event level. In global measurements, researchers assess the overall rates of either SU or RSB. The measure of SU is not restricted to sexual situations. In this case, an individual's global SU across all situations is considered (see Morrison-Beedy, Carey, Feng, & Tu, 2008). Situational measures, on the other hand, specifically assess the extent to which SU and RSB have occurred during a specific range of time or set of sexual encounters. These studies often relate the proportion of occasions in which SU occurs during/prior to sexual behavior to the proportion of occasions in which the individuals