The curvilinear effects of sexual orientation on young adult substance use

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HIGHLIGHTS

- Sexual orientation was studied as a continuous, not categorical, variable.
- Mixed orientation women report higher substance use than exclusively hetero or homosexual women.
- Mixed orientation men report higher marijuana use than exclusively hetero or homosexual men.

ARTICLE INFO

ABSTRACT

Alcohol, tobacco, and marijuana are commonly used by adolescents and linked with harmful health-related outcomes (e.g. injury, dependence). Moreover, heavy episodic (binge) drinking predicts more severe consequences. When examined by sexual orientation, highest rates of substance use have been found among bisexual individuals, with lower use at either end of the spectrum. When examined also by sex, this curvilinear trend is maintained among women but not men. These substance use patterns were identified using group differences (i.e. heterosexual vs. bisexual vs. homosexual). However, evidence suggests that sexual orientation is a continuous, not categorical, variable. This study examined the hypotheses that sexual orientation and commonly used substances (heavy episodic drinking, tobacco, marijuana) would have a quadratic relation among women, but not among men. Six negative binomial regressions tested study hypotheses using data from 7372 participants. Results indicated that sexual orientation had a quadratic relation with heavy episodic drinking, tobacco use, and marijuana use among women, as hypothesized. Additionally, a quadratic relation was found between marijuana use and sexual orientation among men. These findings indicate that women identifying as having mixed sexual orientation are at higher risk than women at either end of the sexual orientation continuum for substance use and related negative outcomes. For men, this is only true for marijuana use and resultant negative consequences. This observed increased use may relate to coping with increased stressors, which has been linked to more problematic use. By better understanding LBG identities and behaviors, clinicians and researchers will be more adept at identifying risk factors and better understanding the nuances across the sexual orientation spectrum.

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Substance use is common among young adults, including college students (Substance Abuse and Mental Health Services Administration [SAMHSA], 2015). Of students 18 to 22, 21% report having used tobacco in the past month, 59.4% having used alcohol, with 39% reported of those reporting heavy episodic, or binge, drinking, and 19.4% having used marijuana (SAMHSA, 2015; Suerken et al., 2015). Alcohol use, both casual and binging, is higher among college students than their non-student, same-aged peers (SAMHSA, 2015). Engagement in substance use is linked to a number of risky behaviors and negative outcomes. Cigarette smoking is associated with numerous health issues and illnesses (Centers for Disease Control and Prevention, 2008). Alcohol use, particularly heavy episodic drinking, is related to academic,

legal, physical and mental health problems, including unintended injury or death, risky sexual encounters, unsafe driving, and other regretted behaviors (Vicary & Karshin, 2002). Marijuana use influences impaired judgment and memory, increased likelihood of engaging in risky behaviors, and unintended injury (Volkow, Baler, Compton, & Weiss, 2014). Further, dependence on any of these substances poses increased risks of use and negative outcomes.

Among lesbian, gay, and bisexual (LGB) adolescents there are higher reported substance use and related disorders compared to their heterosexual peers (Marshal et al., 2008). When examined by sexual orientation, college students who identify as bisexual are more likely to engage in risky behaviors, such as drug use or non-suicidal self-injury, than their homosexual or heterosexual counterparts (Benau, Jenkins, & Conner, 2016; Ford & Jasinski, 2006). This quadratic relation, where use at the "center" of the sexual orientation continuum, bisexual, is

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higher than at its ends, hetero- or homosexual, is seen in alcohol, tobacco, and marijuana use (Coker, Austin, & Schuster, 2010; Eisenberg & Wechsler, 2003; Ford & Jasinski, 2006; Trocki, Drabble, & Midanik, 2009). However, though generally upholding a quadratic trend, the exact relations become inconsistent when broken down by sex.

Lesbian women report more frequent heavy drinking episodes than heterosexual women, while bisexual women consistently report more episodes than both lesbian and heterosexual women (Coker et al., 2010; Eisenberg & Wechsler, 2003; Trocki et al., 2009). However, this relation differs for men, as bisexual and gay men report less heavy episodic drinking than heterosexual men (Eisenberg & Wechsler, 2003). Yet, this finding is also inconsistent, as Coker et al. (2010) found that bisexual men binge drink more than heterosexual men. Concerning tobacco use among women, a quadratic relation of use by sexual orientation mirrors that of binge drinking. Among men, some studies have found that those identifying as bisexual may use more tobacco than heterosexual and gay men (Coker et al., 2010), while other studies have found nonsignificant differences in men's tobacco use by sexual orientation (e.g. Eisenberg & Wechsler, 2003; Trocki et al., 2009). Regarding marijuana, results for women have consistently shown higher use among bisexual women than lesbian or heterosexual women, with heterosexual women often reporting less use than lesbian women (Eisenberg & Wechsler, 2003; Ford & Jasinski, 2006; Trocki et al., 2009). Male marijuana use by sexual orientation has mixed findings, with results indicating higher, lower, or nonsignificant differences between gay, bisexual, and heterosexual use.

Potential reasons for increased substance use in LGB individuals are varied. LGB individuals face unique environmental stressors, such as homophobia and discrimination (Hatzenbuehler, 2009). LGB individuals also experience higher rates of victimization and abuse. These stressors may create internalized homophobia, confusion, depression, anxiety, and other difficulties (Eisenberg & Wechsler, 2003). This may be exacerbated for bisexual individuals as they may face stigma from both heterosexual and homosexual peers. Increased substance use may occur as a coping mechanism for the aforementioned life stressors. Using drugs to cope strongly predicts substance dependence and other life problems (Cooper, Russell, & George, 1988). Alternatively, LGB individuals may be more open to experiences, as evidenced by more sexual exploration and experimentation (Eisenberg & Wechsler, 2003).

When comparing male and female past month heavy episodic drinking (15.4%, 12.1%), marijuana use (10.9%, 6.0%), and tobacco use (31.1%, 19.7%) frequencies, rates of use are notably higher among men (SAMHSA, 2015). Similarly, research has found higher rates of dependence for all three aforementioned substances among males (Anthony, Warner, & Kessler, 1994; Brady & Randall, 1999). Since men are more likely to use drugs, there may be more factors influencing use among men than among women. Therefore, the influence of sexual orientation may account for less variance explaining substance use among men. Moreover, women more often report using substances to cope with stress (Brady & Randall, 1999). Since bisexual women may be experiencing unique stressors beyond those of other women (e.g. biphobia), using substances to cope may account for some of the quadratic relation. Furthermore, using drugs to cope with stress may reinforce habitual use (Cooper et al., 1988), thus strengthening the quadratic trend.

As findings relating substance use, sex, and sexual orientation have been inconsistent (e.g. alcohol use in gay men), further exploration into this topic will help clarify the nature of these relations. Additionally, past research has examined these relations by group differences (i.e. heterosexual vs. bisexual vs. homosexual), which limits both the recognition and influence of the diversity of sexual orientation identities. Kinsey, Pomeroy, and Martin (1948) supported that sexual orientation may best be represented in a continuous manner. Subsequent research has shown that measuring sexual orientation on a continuum allows for a better understanding of how orientation and attraction operate and influence decision making (Vrangalova & Savin-Williams, 2012). However, there have yet to be studies examining substance use using a continuous sexual orientation scale. As alcohol, tobacco, and marijuana are the three most commonly used substances, investigating their use with this more nuanced approach may provide findings that are the most generalizable (SAMHSA, 2015). It was hypothesized that among women, a quadratic relation would be upheld between sexual orientation and use of each substance, with highest use among individuals with a mixed sexual orientation. However, it was hypothesized that for men, nonsignificant relations would be found between sexual orientation and substance use.

1. Methods

1.1. Participants and procedures

Undergraduate college students ($N = 7372$) at a Colorado and a Pennsylvania university completed a survey as part of a study on personality and health risk behaviors. Participants were recruited from psychology courses and participated in exchange for research credit. The survey was either taken online or in a computer lab. If participants completed the survey in the lab, they were given cubicles to help ensure privacy and encouraged to respond honestly. Participants were all over 18 years of age ($M = 20.16$, $SD = 2.99$), 65.9% female, 10.7% Hispanic, 63.5% White/European American, 29.6% multiracial, and 9.6% identifying as other races. Full demographic data are presented in Table 1. This study received IRB approval from both institutions.

1.2. Measures

Sexual orientation was assessed using both a 7-point scale and an open-ended self-report question. The scale ranged from 1, indicating exclusively gay or lesbian, to 7, indicating exclusively heterosexual, with an internal anchor 4, indicating being bisexual ($M = 6.55$, $SD = 1.19$). For men, $M = 6.63$ ($SD = 1.18$), and for women, $M = 6.51$ ($SD = 1.19$). It also included the option to "Prefer not to respond" ($N = 17$). This scale, based on Kinsey et al. (1948), allows for more variance than a categorical or dichotomous measure, allowing participants to more accurately describe their sexual orientation. Research has also shown that this method of assessment is preferred by participants (Drucker, 2012; Korchmaros, Powell, & Stevens, 2013). The open-ended item allowed participants to enter how they identify their sexual orientation without being restricted to pre-defined categories (i.e. heterosexual, bisexual, homosexual) that limit variability and force definitions that some may not agree with (Korchmaros et al., 2013).

Heavy episodic drinking, tobacco, and marijuana use were assessed through the Risky Behaviors Inventory (RBI; Conner & Henson, 2013). The RBI contains questions wherein participants indicate whether they have ever engaged in a behavior and, if endorsed, how often and to what extent they engage in said risky behavior. Heavy episodic drinking, defined as four or more standard drinks for women or five or more standard drinks for men in one occasion (SAMHSA, 2015), was assessed by asking frequency of heavy episodic drinking in the past 30 days. For

Table 1
Demographic statistics.

Sex %	Age	Race %	Ethnicity %
Female = 65.9 Male = 34.1	$M = 20.61$ $SD = 2.99$	American Indian = 0.7 Asian/Asian American = 3.1 Black/African American = 3.0 Native Hawaiian/Pacific Islander = 0.2 White/European American = 63.5 Multiracial = 26.9 DNR = 2.6	Hispanic/Latino = 10.7 Non-Hispanic/Latino = 84.0 DNR = 5.2

Note: $N = 7372$.