



Gender differences in the associations among marijuana use, cigarette use, and symptoms of depression during adolescence and young adulthood



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HIGHLIGHTS

- Gender differences in marijuana use, cigarette use, and depression were examined.
- Depressive symptoms were related to marijuana use in males, but not in females.
- Marijuana and cigarette use were related, especially in males with more depression.
- Cigarette use is more strongly associated with marijuana use during adolescence.
- Relationships with depression are specific to marijuana use, not cigarette use.

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ABSTRACT

Introduction: As prevalence of marijuana use increases, it is important that we better understand how factors like gender, cigarette use, and depression are related to marijuana use during adolescence and young adulthood. We examined longitudinal relationships among these variables in adolescents moving into young adulthood who were studied longitudinally for six years.

Methods: 1263 individuals were included in the study. Participants were oversampled for ever-smoking a cigarette at baseline, when they were 15–16 years old. Frequency of cigarette smoking and marijuana use, as well as depression symptoms, were assessed at baseline, 6, 15, 24, 60 and 72 months.

Results: Cigarette use frequency and depression symptoms were associated with frequency of marijuana use (p -values < .001), particularly in adolescence, but there were important gender differences in these relationships. Specifically, symptoms of depression were related to marijuana use frequency among males (p < .001), but not females (p = .62). In addition, frequency of marijuana use was associated with increased cigarette use frequency, especially among males who had higher symptoms of depression (p < .001). However, this effect was not seen among females. Exploratory analyses suggested that relationships between frequency of use and depression are specific to marijuana, not cigarettes.

Conclusions: Marijuana use is strongly related to depression symptoms and cigarette use frequency in males, indicating that in males these detrimental factors converge, whereas in females they do not. Gender differences in the factors related to marijuana use may mean that there are different risks for and consequences from use and have implications for prevention and intervention efforts.

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1. Introduction

Marijuana and cigarettes, two commonly used substances among adolescents and young adults (Johnston, O'Malley, Miech, Bachman, &

Schulenberg, 2014) are often used concurrently (Kandel & Yamaguchi, 1993; Patton, Coffey, Carlin, Sawyer, & Wakefield, 2006; Prince van Leeuwen et al., 2013; Rigotti, Lee, & Wechsler, 2000; Silins et al., 2013), leading to escalating use and severity of dependence (Degenhardt, Hall, & Lynskey, 2001; Kandel & Yamaguchi, 1993; Korhonen et al., 2008; Lynskey, Fergusson, & Horwood, 1998; Mathers, Teambourou, Catalano, Williams, & Patton, 2006; Patton et al., 2006). These substances are each associated with negative outcomes, including

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increased risk of depression (Brook, Lee, Brown, & Finch, 2012; CDC, 2012, 2013; Cuijpers, Smit, ten Have, & de Graaf, 2007; Degenhardt, Hall, & Lynskey, 2003; Hayatbakhsh et al., 2007; Klungsoyr, Nygard, Sorensen, & Sandanger, 2006; Mathers et al., 2006; Pedersen & von Soest, 2009; van Laar, van Dorsselaer, Monshouwer, & de Graaf, 2007), especially if use is initiated in adolescence (Silins et al., 2014); but these relationships may differ by gender. Gender differences occur in prevalence, rate, and frequency of marijuana and cigarette use (Johnston et al., 2014; SAMSHA, 2013), and in prevalence of depression (Hankin & Abramson, 1999; Kuehner, 2003; Piccinelli & Wilkinson, 2000). Understanding how cigarette use, symptoms of depression, and gender are related to marijuana use during adolescence and young adulthood may help to develop better interventions.

Several studies have found a reciprocal relationship in the prevalence and severity of cigarette and marijuana use (Degenhardt et al., 2001; Kandel & Yamaguchi, 1993; Korhonen et al., 2008; Lynskey et al., 1998; Mathers et al., 2006; Patton et al., 2006). Cigarette users are more likely to engage in subsequent marijuana use (Kandel & Yamaguchi, 1993; Patton et al., 2006; Prince van Leeuwen et al., 2013; Rigotti et al., 2000; Silins et al., 2013), and cigarette users who also use marijuana are more likely to escalate cigarette use and develop nicotine dependence (Agrawal, Madden, Bucholz, Heath, & Lynskey, 2008; Patton, Coffey, Carlin, Sawyer, & Lynskey, 2005; Patton et al., 2006; Timberlake et al., 2007; Tullis, Dupont, Frost-Pineda, & Gold, 2003). Males are more likely to use marijuana and cigarettes, and they use these substances in greater amounts than females (Johnston et al., 2014; SAMSHA, 2013). However, few studies have examined gender differences in marijuana and cigarette use over time. One recent longitudinal study found that adolescent females were more likely to use cigarettes than males, and while there was no difference in marijuana use during early adolescence, males escalated their marijuana use compared to females throughout adolescence (Mahalik et al., 2013). Males also escalated their cigarette use throughout adolescence, surpassing females' use, and remained heavier cigarette smokers in young adulthood. Females "catch up" over time to males in marijuana use, and gender differences in amount of use may diminish in young adulthood (Mahalik et al., 2013).

Marijuana and cigarette use is often initiated during adolescence, a time when individuals are experiencing substantial neural, emotional, cognitive, physical, sex- and gender-related development and when many mental disorders, including depression, emerge (Copeland, Shanahan, Costello, & Angold, 2011). As adolescents transition to young adulthood, they usually experience significant environmental changes (e.g., leaving home); social and relationship changes; school/work changes; and intrapersonal changes (e.g., self-concept, affect regulation strategies); which may all contribute to substance use changes (Brown et al., 2008). Due to the developmental and psychosocial differences between adolescence and young adulthood, we need to further understand marijuana and cigarette use patterns across these distinct periods.

Given the high comorbidity between marijuana and tobacco use and depression, symptoms of depression may be a key factor involved in initiation and continued use of these substances. Symptoms of depression are associated with marijuana and tobacco use (Boden, Fergusson, & Horwood, 2010; Brown, Lewinsohn, Seeley, & Wagner, 1996; Libby, Orton, Stover, & Riggs, 2005; Volkow, 2004; Weinstein & Mermelstein, 2013) and heavy marijuana use may increase depressive symptoms over time and vice versa (Degenhardt et al., 2003; Patton et al., 2005). The relationship between marijuana use and depression may differ by gender, although the findings are mixed (Patton et al., 2002 versus Schepis et al., 2011). In an intriguing demographic juxtaposition, gender differences in depression (females higher) and substance use (males higher) emerge in adolescence, but this does not necessarily indicate that these problems are independent. Rather, these problems appear to be linked, but potentially in different ways for males and females. It is not yet clear if the relationship between heavier marijuana use and

higher symptoms of depression varies over adolescence and young adulthood in males and females. In an earlier study with the same longitudinal cohort as the current study, our group found that more depression symptoms at baseline were associated with more frequent marijuana use two years later in adolescence for males, but not for females (Schuster, Mermelstein, & Wakschlag, 2013). However, it remains unclear how the gender-specific relationship between depression and marijuana changes over time between adolescence and young adulthood.

The goal of the current study was to extend our previous findings of a gender-specific relationship between marijuana use frequency and depression symptoms in adolescence (Schuster et al., 2013) to now examine the relationship between gender, marijuana use, cigarette smoking, and depression symptoms during the transition from adolescence (<18 years old) to young adulthood (>18 years old) in a longitudinal sample that has been followed for six years (Social and Emotional Contexts of Adolescent Smoking Patterns [SECASP] study). Consistent with prior literature and findings from earlier waves with this cohort, we expected that: marijuana use frequency would increase over time; males would use marijuana more frequently than females; and more frequent cigarette use would be related to more frequent marijuana use, especially among males. We also hypothesized that (1a) more symptoms of depression would be related to increased marijuana use frequency, (1b) especially for females, and (1c) this effect would increase over time. Furthermore, we (2) hypothesized that more symptoms of depression and more frequent cigarette use would have an interactive effect, increasing marijuana use frequency.

2. Methods

2.1. Participants

The sample was drawn from the longitudinal SECASP study, which has been described elsewhere (Dierker & Mermelstein, 2010; Dierker, Selya, Piasecki, Rose, & Mermelstein, 2013; Selya et al., 2013). The program project recruited a cohort of adolescents (mean baseline age = 15 years) oversampled for ever-smoking a cigarette (83% ever-smoked), and thus at high risk for smoking escalation. Participants were 9th and 10th graders from 16 Chicago-area high schools, which were selected to reflect the area demographics. Of 3654 students invited, 1344 agreed to participate, and 1263 (94%) completed baseline measurements. Participants completed questionnaires assessing substance use and psychosocial factors at baseline, 6, 15 months, and 2, 5 and 6 years. Retention at 6 years was greater than 85%, and participants and nonparticipants at 6 years did not differ by gender, race/ethnicity, or age. For the present study, participants were included if they were assessed at three or more waves and were assessed at either 5 or 6 years ($n = 1108$). The Institutional Review Board at the University of Illinois at Chicago approved the study and written informed consent was obtained.

2.2. Demographics, substance use, and depression

Demographic information was obtained through self-report questionnaires.

2.2.1. Marijuana and cigarette use frequency

For each wave, participants reported frequency of marijuana use and cigarette use (number of days they used each substance) in the past month. Marijuana use frequency was measured using a single item question with 5 ordinal options coded as: 0 = zero days; 1 = one day a month or less; 3 = more than one day a month but less than one day a week; 9 = more than one day a week but less than daily; 27 = every day. Cigarette use frequency was measured using a single item question with 9 ordinal options coded as: 0 = zero days; 1 = one day; 3 = 2–3 days; 5 = 4–5 days; 7 = 6–7 days; 9 = 8–10 days; 16 = 11–

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