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Longitudinal associations of cannabis and illicit drug use with depression, suicidal ideation and suicidal attempts among Nova Scotia high school students

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ABSTRACT

Objective: To examine associations of cannabis and other illicit drug use with depression, suicidal ideation and suicidal attempts over a two year period during adolescence.
Methods: Nine hundred and seventy-six school students in four high schools in northern Nova Scotia, Canada, were surveyed in grade 10 and followed up in grade 12. Assessments of past 30 day cannabis and illicit drug use as well as mental health variables (risk of depression, suicidal ideation and suicide attempts) were obtained at baseline (2000 and 2001) and follow-up two years later (2002 and 2003). Generalized estimating equations modelled depression, suicidal ideation and attempts among illicit drug users and non-users.
Results: Illicit drug use with or without cannabis use was significantly associated with higher odds of depression, suicidal ideation and suicide attempt. Heavy cannabis use alone predicted depression but not suicidal ideation or attempt.
Conclusions: Illicit drug use, with and without accompanying cannabis use, among high school students increases the risk of depression, suicidal ideation and suicidal attempts. Heavy cannabis use alone predicts depression but not suicidal ideation or attempts.

1. Introduction

Major depression and suicidal behaviours occur relatively commonly among adolescents. By age 21, up to 25% of young people experience an episode of major depression (Kessler et al., 2001; Rao and Chen, 2009). Episodes of major depression are associated with psychosocial impairment and increase the risk of suicide (Haarasilta et al., 2001; Bridge et al., 2006; Cash and Bridge, 2009). In the United States, 14.5% of grade 9–12 students report suicidal ideation and 6.9% report a suicide attempt in the past year (Eaton et al., 2008; Cash and Bridge, 2009). Depression is a major predictor of suicidal ideation and between 40 and 80% of adolescents meet criteria for depression at the time of a suicide attempt (Beautrais et al., 1998; Goldston et al., 1998; Gould et al., 1998). Both depression and suicidal behaviours during adolescence can increase the risk of psychiatric problems in adulthood (Reinherz et al., 2006; Fergusson et al., 2007; Herba et al., 2007). Understanding the factors associated with the development of major depression and suicidal behaviour during adolescence is important in prevention, in helping individuals in acute stages of these conditions, and to change the life course of affected individuals.

As with poor mental health, high rates of illicit drug use are observed among adolescents and young adults in most developed countries (Smart and Ogborne, 2000). In Canada, over 25% of individuals aged 15–24 report using cannabis in the past year and eight percent report using other illicit drugs (Health Canada, 2010). In Nova Scotia, 32% of students used cannabis in the past year (Atlantic Working Group, 2007). Studies conducted elsewhere, including New Zealand, the United States and Europe have also reported high rates of illicit drug use (Hall and Solowij, 1998; Farrell, 1999; Fergusson and Horwood, 2000). While many cannabis users do not use other illicit drugs, the literature has shown cannabis use to be predictive of other illicit drug use (Lynskey et al., 1999; Raphael et al., 2005; Fergusson et al., 2008).

High rates of illicit drug use among adolescents have raised concerns about the impacts of these substances on mental health. The literature has focused on associations of illicit drug use (particularly cannabis use) and psychotic disorders, but there is an expanding body of work that examines specific associations between cannabis use, depression and suicidal behaviours. Researchers have observed cross-sectional associations between cannabis use and a higher likelihood of depressive symptoms (Patton et al., 2002; Degenhardt

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et al., 2003; Rey et al., 2004; Poulin et al., 2005). Longitudinal studies suggest that weekly cannabis use increases the risk of depression in young adulthood (Fergusson et al., 2002; Hayatbakhsh et al., 2007). However, a recent systematic review noted that while most longitudinal studies showed an increased risk of affective disorders among people who had used cannabis, the confidence limits were most consistent with null effects (Moore et al., 2007).

Some researchers have hypothesized that these associations may relate to other psychosocial consequences of drug use (e.g., decreased educational attainment, legal difficulties) which then lead to increased likelihood of depression, rather than drug use itself being the proximate cause (Kandel et al., 1986; Hayatbakhsh et al., 2007). Most longitudinal studies have examined associations of illicit drug use in early adolescence with adult depression (age 21–27) but less is known about these associations during adolescence (Patton et al., 2002; Georgiades and Boyle, 2007; Hayatbakhsh et al., 2007; Pedersen, 2008). A clear delineation of potential risks of drug use on poor mental health during adolescence can shed light on potential underlying mechanisms (Saban and Flisher, 2010).

A focus of the literature has been examining independent associations of cannabis use and later depression. However, the limited available research has suggested that illicit drug use other than cannabis in adolescence has comparatively stronger associations with depression outcomes than cannabis use alone (Neighbors et al., 1992; Brook et al., 2002). Given that a substantial number of cannabis using adolescents also use other illicit substances, quantifying affective behaviour outcomes in this group is important.

Cross-sectional studies have examined the associations of illicit drug use and suicidal ideation and attempts and shown that illicit drug use is associated with suicidal behaviours in adolescents independent of the effects of comorbid depression (Chabrol et al., 2008; Kim et al., 2011). Prospective studies examining the association of adolescent drug use with later suicidal behaviour have focused on cannabis and have yielded mixed results. In a birth cohort of New Zealand children, Fergusson et al. found that cannabis use was associated with suicidal behaviour in younger individuals (ages 14–15), but cannabis use during young adulthood (ages 20–22) was not associated with suicidal behaviour (Fergusson et al., 2002). Reporting on a population based study in Norway, Pedersen et al. did not find a longitudinal association between adolescent cannabis use and adult depression, suicidal ideation or attempts (Pedersen, 2008). In this sample, however, only 5% of 16 year olds reported any cannabis use in the past year, a figure considerably lower than that for Canadian adolescents. Further, the study did not include a measure of other illicit substance use. Using a large, school-based sample in the U.S., Borowsky et al. found that adolescents who used cannabis or other illicit drugs had higher odds of suicide attempt over a one-year period (Borowsky et al., 1999). Elucidating the longitudinal associations between cannabis use and suicidal behaviour is crucial to developing an understanding of risks among adolescents who use substances.

We sought to fill gaps in the existing literature by examining the associations of cannabis and other illicit drug use with depression and suicidal behaviours in a Canadian sample of adolescents. We are particularly interested in determining whether these associations differ based on comorbidity of illicit substances used.

We addressed two questions:

(1) What are the associations between cannabis and other illicit drug use, depression, and suicidal behaviour in Nova Scotia high school students over a two year period?
(2) Is a higher frequency of cannabis use associated with depression and suicidal behaviour independent of other drug use over a two year period?

2. Method

2.1. Sample

Data from the Adolescent Health Study (AHS) were used for this analysis. The AHS is a study carried out in four high schools in northern Nova Scotia from 2000 to 2003 and represents approximately 30% of students in the school district. All grade 10 students registered at the schools and present on the day of the study were invited to participate in an anonymous self-completion survey questionnaire. Over 90% (90.4%) of students in grade 10 in each of the baseline years completed the baseline survey ($n = 1582$). Two years later (in 2002 or 2003), the same students were invited to complete a follow-up survey. In total, 976 individuals (61.9% of the baseline sample) responded to both questionnaires. Main reasons for attrition include dropping out of high school (8.3% of females and 13.2% of males dropped out of high school in Nova Scotia in 2000; Statistics Canada, 2011), school absence on the day of the follow-up survey, which is typically 13% (Paglia-Boak et al., 2010), and moving away from the district.

2.2. Survey administration

Written consent was obtained from participants. Teachers administered surveys during regular class time with members of the research team present. Teachers were instructed not to approach students as they completed surveys. Parents were not required to give written consent, but were informed of the study through a letter sent home with their children and they were given the option of informing the school if they did not wish their children to participate. Ethics approval was obtained from the Dalhousie University Health Sciences Human Research Ethics Board.

2.3. Measures

Risk for depression was measured using the 20 item Center for Epidemiological Studies Depression Scale (CES-D), using established cut-offs for adolescents (≥24 for females, ≥22 for males; Rushton et al., 2002). Suicidal thinking/planning and suicide attempt were measured as having had these experiences in the previous year, using questions from the Centers for Disease Control and Prevention Youth Risk Behavior Surveillance System survey (Kann et al., 1998). The key predictor variables were illicit drug use (illicit drug use alone/illicit drug use with cannabis/cannabis alone). Individuals were asked how often in the past 30 days they used marijuana. Options were: (1) no use; (2) 1–2 times; (3) 3–9 times; (4) 10–19 times; (5) 20–39 times; (6) 40 or more times. They were also asked if they used any of the following drugs in the past 30 days: LSD, opiates, stimulants, barbituates, tranquilizers, cocaine, anabolic steroids, PCP, solvents, psilocybin, ecstasy, and other. For each drug, colloquial names were included as descriptors. Drug use pattern was classified according to reported use in the past 30 days: (1) cannabis and other illicit drug use; (2) illicit drug use only; (3) cannabis use only; (4) no drug use. In the presented analysis, the cannabis use cut-off was any use in the past 30 days. For analyses specifically examining frequency of cannabis use in the past 30 days, the original variable was divided into a four level variable (1) no use; (2) 1–2 uses; (3) 3–9 uses; (4) more than 10 uses. Alcohol use was included as a potential confounding variable as it is associated with illicit drug use, depression and suicidal behaviour (Deas and Brown, 2006; Cash and Bridge, 2009). Alcohol consumption was divided into heavy alcohol use (having had ≥5 drinks at one sitting ≥3 times within the past 30 days) and lower alcohol use (no binges in the previous month, or ≤2 binges). Other covariates included living situation (living with both parents vs. other arrangement); school mark at last report card (dichotomized as <70% vs. ≥70%), age and gender as these variables have been shown to be associated with substance use, depression, mental disorders and suicidal behaviour (Cash and Bridge, 2009; Merikangas et al., 2009). Reliability of these measures was assessed by repeated survey administration at another high school in the same area of rural Nova Scotia. Kappa statistics ranged from 0.76 to 1.0.

2.4. Statistical analysis

All statistical analysis was done using SAS 9.2. First, all variables at both time points were examined using the χ^2 statistic to detect any significant changes in prevalence of independent and outcome variables over the two year period.

To determine associations of drug use and depression, suicidal ideation and attempt over a two year period, two sets of analyses were conducted using the balanced sample. One used pattern of concurrent drug use as the main independent variable of interest and the second used frequency of cannabis use. SAS PROC GENMOD was used to generate generalized estimating equations (GEE) with a link logit function and an exchangeable correlation structure. Measures of drug use were the independent variables of interest in the equations modelling outcomes over the two time points. First, unadjusted regressions were conducted, followed by adjusted regressions including all other independent variables. For concurrent drug use models, no illicit drug use was the reference category. Cannabis use alone was also set as the reference category and the analysis repeated to determine whether there were differences in outcomes between cannabis users alone and those using other illicit drugs. For frequency of cannabis use models, no cannabis use was the reference category. Depression was included as a covariate in the GEE models for suicidal