



The relationship between cannabis involvement and suicidal thoughts and behaviors[☆]



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ARTICLE INFO

Article history:

Received 22 September 2014

Received in revised form 5 February 2015

Accepted 14 February 2015

Available online 26 February 2015

Keywords:

Suicidal thoughts and behaviors

Cannabis use

Cannabis use disorder symptoms

ABSTRACT

Background: In the present study, we examined the relationship between cannabis involvement and suicidal ideation (SI), plan and attempt, differentiating the latter into planned and unplanned attempt, taking into account other substance involvement and psychopathology.

Methods: We used two community-based twin samples from the Australian Twin Registry, including 9583 individuals (58.5% female, aged between 27 and 40). The Semi-Structured Assessment of the Genetics of Alcoholism (SSAGA) was used to assess cannabis involvement which was categorized into: (0) no cannabis use (reference category); (1) cannabis use only; (2) 1–2 cannabis use disorder symptoms; (3) 3 or more symptoms. Separate multinomial logistic regression analyses were conducted for SI and suicide attempt with or without a plan. Twin analyses examined the genetic overlap between cannabis involvement and SI.

Results: All levels of cannabis involvement were related to SI, regardless of duration (odds ratios [ORs] = 1.28–2.00, $p < 0.01$). Cannabis use and endorsing ≥ 3 symptoms were associated with unplanned (SANP; ORs = 1.95 and 2.51 respectively, $p < 0.05$), but not planned suicide attempts ($p > 0.10$). Associations persisted even after controlling for other psychiatric disorders and substance involvement. Overlapping genetic ($rG = 0.45$) and environmental ($rE = 0.21$) factors were responsible for the covariance between cannabis involvement and SI.

Conclusions: Cannabis involvement is associated, albeit modestly, with SI and unplanned suicide attempts. Such attempts are difficult to prevent and their association with cannabis use and cannabis use disorder symptoms requires further study, including in different samples and with additional attention to confounders.

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1. Introduction

Worldwide, the lifetime prevalence of suicidal ideation (SI), suicide planning, and attempt is estimated between 3.1 and 56.0%,

between 0.9 and 19.5%, and between 0.4 and 5.1%, respectively, in adult populations (Nock et al., 2008a). Among adults reporting SI and a plan, 56% are estimated to have made an attempt, while 15.4% have made an attempt without a plan (Nock et al., 2008b). Suicide attempts are amongst the most powerful predictors of completed suicide (World Health Organization, 2014). Regardless of completion, suicide attempts exact a considerable economic burden via medical care accrued and lost productivity (American Foundation for Suicide Prevention, 2012). Alarming, between 2011 and 2012, suicide attempts rose by 2.4% and remain the 10th leading cause of mortality in the U.S. (Xu et al., 2014).

[☆] Supplementary material can be found by accessing the online version of this paper. See Appendix A for more details.

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Suicidal thoughts and behaviors (STB; ideation, planning, attempt) are strongly related to substance use behaviors, including cannabis involvement (Byrne et al., 2004; Calabria et al., 2010; Johns, 2001; Moore et al., 2007; Pompili et al., 2012), especially early (Byrne et al., 2004; Lynskey et al., 2004) and heavy cannabis use or cannabis use disorders (CUD; Fergusson et al., 2002; Johns, 2001; Lynskey et al., 2004; Pedersen, 2008; Pompili et al., 2012; Van Ours et al., 2013). For instance, Silins et al. (2014) recently reported that suicide attempts were substantially increased (adjusted odds-ratio >6) in young daily cannabis users.

Other studies suggest that the relationship between cannabis involvement and STB may be explained by shared risk and protective influences (Harris and Barraclough, 1997). For instance, in a longitudinal study of Swedish conscripts, the association between cannabis use and completed suicide was entirely explained by confounders, including other substance use and psychological adjustment (Price et al., 2009). Likewise, Wilcox et al. (2010) found that the relation between CUD and SI in college students disappeared when accounting for confounding factors such as depressive symptoms and maternal depression.

Another challenge is that items querying STB are frequently embedded in diagnostic interview sections assessing major depressive or bipolar disorder, such that only individuals reporting mood-related symptoms or episodes are presented with these questions. In addition, a majority of studies have disregarded intensity and duration of ideation (Joiner and Rudd, 2000) and the distinction between planned and unplanned attempts, even though their etiology may differ. In particular, planned attempts are more common in samples that require presence of dysphoric or anhedonic mood in the assessment of suicide (Simon et al., 2002) and their relationship with substance use may also vary. For example, Borges et al. (2000) showed that using one or more substances was related to suicide attempts without planning (SANP), but not to suicide attempts that were planned (SAP). The authors attributed this difference to the disinhibition hypothesis, which proposes that, when using drugs, inhibitions to make an impulsive attempt are reduced, therefore increasing the risk of suicide attempts (Mayfield and Montgomery, 1972; Rossow and Wichström, 1994), although whether attempts were in the context of substance use was not assessed. The finding is also consistent with the notion, as stated by Conner et al. (2007) in their study on alcohol dependent men and women, that SANP are related to impulsivity, while SAP are more related to depression, and are also more likely to result in completion (Harris et al., 2005).

Cannabis involvement and SI are both influenced by genetic factors to a similar degree ($h^2 = 40\text{--}60\%$; Maciejewski et al., 2014; Verweij et al., 2010) with evidence for non-additive genetic influences on SI. However, little is known of the extent to which shared genetic factors contribute to their comorbidity. One study (Lynskey et al., 2004) found that CUD was associated with SI and suicide attempts, even in identical twin pairs who shared 100% of their genetic background. The twin with cannabis dependence was at 2.9 and 2.5 greater odds of SI and suicide attempt relative to their genetically-related nondependent co-twin, suggesting that individual-specific environmental factors that are correlated across cannabis involvement and STB but are not shared by members of a twin pair were important. However, the extent of the genetic and environmental overlap between cannabis involvement and STB was not examined.

The present study expands upon this prior research by (a) studying varying levels of cannabis involvement, including use and use disorders; (b) examining both SI and suicide attempt separately; (c) expanding the definition of suicide attempts to include planning and (d) estimating the magnitude of genetic overlap between cannabis involvement and STB. We hypothesized that cannabis

involvement would be associated with SI and suicidal attempts in a dose-response fashion, however, associations with the latter would only be restricted to those reporting SANP. Furthermore, we expected moderate genetic and individual-specific environmental correlations to contribute to the association between cannabis involvement and SI.

2. Method

2.1. Sample and respondents

Data were derived from two community-based samples from the Australian Twin Registry (ATR). Sample 1 included 6257 individuals (55.2% female) aged 24–36 (mean age 29.9, SD = 2.5) who were interviewed between 1996 and 2000 (Lynskey et al., 2002). Sample 2 included 3326 twins (64.8% female), aged 27–40 (mean age 31.9, SD = 2.5), who were interviewed between 2005 and 2009 (Lynskey et al., 2012). Additionally, 476 nontwin siblings were interviewed. However, as the age range was broad (21–46 years) and some of them may not have been past the age of risk for CUD symptoms (Wagner and Anthony, 2002), we excluded the nontwin siblings from analyses. Despite different birth years and different years at interview, the twins from both samples were approximately (within two years) the same age at the time of the interview. The total sample consisted of 9583 individuals (58.5% female), with a mean age of 30.6 (SD = 2.6). There were 2472 female identical (monozygotic; MZ) twins, 1630 male MZ twins, 1877 female non-identical (dizygotic; DZ) twins, 1314 male DZ twins, and 2290 opposite-sex DZ twins.

2.2. Procedure

In both ATR samples, assessments were administered using a computer-based telephone or face-to-face interview of the Semi-Structured Assessment of the Genetics of Alcoholism (Australian version SSAGA-OZ; Bucholz et al., 1994; Kramer et al., 2009). Assessments included lifetime history of substance use as well as DSM-IV diagnostic criteria for abuse, dependence as well as other diagnoses, such as conduct disorder (CD), major depressive disorder (MDD), and anxiety disorders, including social anxiety and panic disorders. All participants provided informed consent prior to the interview, as approved by the institutional review boards of Washington University School of Medicine, St. Louis, MO, United States and the Queensland Institute of Medical Research, Brisbane, Queensland, Australia.

2.3. Measures

2.3.1. STBs. All participants, regardless of prior history of depression or psychopathology, were queried about suicidal behaviors (Statham et al., 1998). The question “Have you ever thought about taking your own life?” was used to define SI. Subsequently, participants were asked whether these thoughts lasted for more than a day. Participants were then divided into one of three groups: (1) no SI ($N = 7074$); (2) SI for less than a day ($N = 1602$); and (3) SI for more than a day ($N = 907$). Those who reported SI were queried about whether they had ever made a plan. Regardless of ideation or planning, all participants were asked about whether they had ever tried to take their own life (i.e., suicidal attempt). Those individuals who reported a suicidal attempt and a history of suicidal planning, regardless of whether the plan pertained to the attempt, comprised the group of *suicide attempt with planning* (SAP), while those reporting to have attempted suicide in the absence of a lifetime history of suicide planning comprised the group of *suicide attempt without planning* (SANP). Participants were divided into one of four groups: (1) no suicide plan or attempt, regardless of ideation ($N = 8748$); (2) suicide plan without attempt ($N = 427$); (3) SAP ($N = 246$); and (4) SANP ($N = 162$).

2.3.2. Cannabis involvement. Lifetime cannabis use was assessed with the question “Have you ever used (ever experimented even once with) marijuana or hashish?” During data collection for sample 1, to reduce respondent burden, only 6 CUD symptoms, including two abuse symptoms (use in hazardous situations; interference with major role obligations) and four dependence (needing larger amounts to get an effect [tolerance]; using more frequently or in larger amounts than intended; continued use despite emotional or psychological problems due to use; recurrent desire to cut down) symptoms were queried. These criteria showed good sensitivity and specificity, and a high level of agreement compared to two other national surveys (Lynskey et al., 2002), indicating that this is a valid measure of CUD. While the full set of DSM-IV criteria were available for sample 2 (i.e., 4 abuse and 6 dependence criteria, and withdrawal), we only selected the subset of 6 items that were consistently available across both samples. For cannabis involvement, participants were divided into one of four mutually exclusive groups: (0) no cannabis use ($N = 3566$); (1) cannabis use only (having used at least once, without endorsement of CUD symptoms; $N = 4084$); (2) endorsement of 1–2 CUD symptoms ($N = 939$); and (3) endorsement of 3 or more CUD symptoms ($N = 994$). No cannabis use served as the reference category. However, to satisfy the assumption of multivariate normality, groups 1 and 2 were combined to create a three-level measure for the twin analyses.

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