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Transition to drug co-use among adolescent cannabis users: The role of decision-making and mental health

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HIGHLIGHTS

- Drug co-use among cannabis users (CU) increases the risk of drug use disorders.
- We explored factors associated with drug co-use among 266 adolescent CU.
- Mood disorder symptoms are associated with drug co-use among regular CU.
- Poor decision-making is associated with a faster transition to drug co-use.
- More cannabis use-related problems are associated with more drugs co-used.

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ABSTRACT

Background: Co-use of cannabis and drugs other than cannabis (DOTC) influences the risk of experiencing cannabis disorders. Accordingly, we explored whether speed of transition to drug co-use, the number of DOTC used, and/or being an experimental cannabis-only user, a regular cannabis-only user, or a regular cannabis user who co-uses DOTC (i.e., cannabis-plus user) were associated with decision-making (DM), mental health disorder symptoms, or cannabis use-related characteristics.

Methods: We analyzed baseline data from a sub-sample of 266 adolescent (ages 14 to 16) cannabis users (CU) participating in an ongoing longitudinal study. Assessments included semi-structured interviews, self-report questionnaires, and measures of drug use, DM (measured via the Iowa Gambling Task), mental health disorders, and cannabis use-related problems.

Results: Endorsing a larger number of mood disorders symptoms was associated with being a regular cannabis-plus user rather than a regular cannabis-only user (AOR = 1.08, C.I.95% 1.01, 1.15). Poorer DM was associated with a faster transition to co-use, such that for each one unit increase in DM performance, the years to onset of drug co-use increased by 1% ($p = 0.032$). Endorsing a larger number of cannabis use-related problems was positively associated with endorsing a larger number of DOTC used ($p = 0.001$).

Conclusions: This study provides new evidence on the process of drug co-use among CU. Specifically, mood disorder symptoms were associated with use of DOTC among regular CU. Furthermore, poorer DM was associated with a faster transition to drug co-use. Poorer DM and mood disorder symptoms may aggravate or accelerate the onset of adverse consequences among adolescent CU.

1. Introduction

Legalization of cannabis use for medical and/or recreational use in 29 states, as well as mounting evidence on the health and social effects of cannabis use (Huang et al., 2015; Lubman, Cheetham, & Yücel, 2015; Volkow, Baler, Compton, & Weiss, 2014), indicates that more research is needed to characterize which individuals are most at risk for adverse consequences from their cannabis use. Approximately 6600 Americans over the age of 12 initiate cannabis use every day (Azofeifa, 2016). Approximately 9% of adult cannabis users (CU) (Anthony, Warner, & Kessler, 1994; Lopez-Quintero et al., 2011) will experience physical, mental or social problems of sufficient severity to warrant a diagnosis of a cannabis use disorder.

A myriad of intertwined factors ranging from genetic vulnerability

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to social and cultural exposures influence the pathway from first use to the manifestation of a clinical use disorder and other negative consequences, among both adolescents and adults (Agrawal & Lynskey, 2008; Kendler, Jacobson, Prescott, & Neale, 2003; Kendler & Prescott, 2007). This study focuses on co-use of drugs other than cannabis (DOTC) among CU. This factor has shown to significantly increase the risk of experiencing adverse consequences. For instance, while the risk of developing a drug use disorder for adult cannabis-only users is approximately 2%, it increases to about 17% for CU who also use other drugs (Lopez-Quintero & Anthony, 2015). Moreover, the rates of emergency department visits are higher among adolescent CU (12 to 17 years old) who also use DOTC than among adolescent cannabis-only users (159 visits per 100,000 vs. 79 visits per 100,000) (Zhu & Wu, 2016).

A better characterization of cannabis use patterns and the concomitant use of DOTC may enhance current preventive programs and reduce adverse outcomes. Yet, the factors characterizing the diverse subgroups of CU remain understudied. The available evidence among adolescents and adults suggest that the risk of progression to DOTC among CU is linked to genetic predisposition (Agrawal, Neale, Prescott, & Kendler, 2004), early onset and frequency of cannabis use (Fergusson, Boden, & Horwood, 2006; Lynskey et al., 2012; Moss, Chen, & Yi, 2014; Richmond-Rakerd et al., 2016), internalizing and externalizing symptoms and disorders (Secades-Villa, Garcia-Rodríguez, Jin, Wang, & Blanco, 2015; Tarter, Vanyukov, Kirisci, Reynolds, & Clark, 2006), and increased drug use exposure opportunities (Tarter et al., 2006; Wagner & Anthony, 2002). Research on the speed of DOTC use onset or the number of drugs used among adolescent CU is even more scarce, and the few studies on number of DOTC use available suggest that age of cannabis use onset and response inhibition relate to increased exposure to other drugs (Darke, Kaye, & Torok, 2012) and to a larger number of DOTC used (Nigg et al., 2006), respectively.

The current cross-sectional study adds to the extant body of knowledge by exploring the factors associated with membership in three specific subgroups of CU, namely (1) experimental cannabis-only users; (2) regular CU who exclusively use cannabis (regular cannabis-only users); and (3) regular CU who also endorsed use of at least one DOTC (regular cannabis-plus users). In addition, we investigated the factors associated with speed of transition to drug co-use and the number of DOTC used among cannabis-plus users. The factors selected to characterize our subsample of CU include symptoms of anxiety, mood, and externalizing disorders, decision-making (DM; i.e., ability to make choices in situations with ambiguous contingencies that require tradeoffs between risks and rewards (Bechara, 2005)), and cannabis use-related characteristics (e.g., amount of cannabis used). All of these factors have been linked to more problematic cannabis use and adverse consequences. Specifically, anxiety, mood, and externalizing symptoms, as well as amount of cannabis used, have been independently associated with earlier cannabis use onset, problematic cannabis use, or use of DOTC among CU (Degenhardt et al., 2013; Fergusson et al., 2006; Lopez-Quintero et al., 2011; Secades-Villa et al., 2015). However, the respective contributions of these factors, together with DM, have not been well-studied. Furthermore, the few studies comparing cannabis users who use cannabis (but not other regulated drugs) with those who use cannabis together with other regulated drugs have rarely examined the role of decision-making. In addition, while previous research indicates that impairments in DM and other cognitive abilities are associated with regular drug use (Day, Metrik, Spillane, & Kahler, 2013; De Bellis et al., 2013; Gonzalez, Schuster, Mermelstein, & Diviak, 2015; Hooper, Woolley, & De Bellis, 2014), less is known about their role in the process of drug use involvement. The few available studies suggest that working memory and response inhibition predict alcohol and drug use onset, binge drinking among alcohol naive adolescents, and the number of drugs used (Moeller, Bederson, Alia-Klein, & Goldstein, 2016; Nigg et al., 2006; Norman et al., 2011; Peeters et al., 2015; Tarter et al., 2003). In this study, we focused on DM because its effect on the onset of drug co-use has not been well studied, and because increasing evidence supports its role as an important predictor and moderator of cannabis use outcomes (De Bellis et al., 2013; Gonzalez et al., 2015).

In this study, we anticipated that endorsing more symptoms of mental health disorders, and endorsing a larger number of cannabis use-related problems would be associated with membership in the regular cannabis-plus subgroup regardless of the individual's DM abilities. We also hypothesized that endorsing more symptoms of mental health disorders, endorsing a larger number of cannabis use-related problems, and particularly having poorer DM performance, would be associated with cannabis use group membership, a faster transition to drug co-use, and to endorsing a larger number of DOTC used among regular cannabis-plus users.

2. Study methods

2.1. Study design and participants

In this report, we analyzed baseline data from a subsample of adolescent CU (n = 266) participating in an ongoing longitudinal study that assesses DM and episodic memory in trajectories to cannabis addiction (R01DA031176, PI: Raul Gonzalez). Participants were recruited from South Florida middle and high schools distributed throughout the county. The target population included adolescents at risk for escalation in cannabis use. Inclusion criteria consisted of being 14 to 17 years old at baseline, having the ability to read and write English, and exposure to either alcohol, cigarettes, or cannabis (even if only minimal); however, a subset of participants (approximately 10%) with no substance use at baseline were included in the study. Exclusion criteria included self-reported developmental disorders, neurological conditions, significant birth complications, history of a traumatic brain injury or loss of consciousness for 10+ minutes, a formal diagnosis or history of treatment for a mental health disorder at screening, alcohol or DOTC use patterns suggestive of a use disorder, lifetime use of DOTC (besides alcohol, cannabis, and nicotine) > 10 times, or use of DOTC in the two weeks prior to assessment, and lifetime use of DOTC to an extent greater than their cannabis use. In addition, the current study excluded participants who never used cannabis or those whose patterns of use were not consistent with those in the specified subgroups (e.g., not having used cannabis more than three times in the lifetime, and 15 experimental users who also endorsed DOTC use). All participants underwent oral fluid toxicology testing to assess for recent use of THC, cocaine, opiates, amphetamines, methamphetamines, barbiturates, benzodiazepines, and PCP using the Intercept oral fluid drug test (OraSure Technologies, Inc.: Bethlehem, PA). Study participants were not required to discontinue or change their drug use behaviors to be included in the study. Study measures consist of structured interviews, paper-and-pencil questionnaires, and computerized measures of DM. Assessment spanned demographics, mental health, patterns of substance use, prevalence of substance use disorders, and neurocognitive functioning. Participant assent and parental consent were obtained for all participants. All study procedures and protocols were approved by the Institutional Review Board at Florida International University.

2.2. Measures

2.2.1. Cannabis use and subgroup membership

Participants who indicated having used any drug at least three times completed the Drug-Use History Questionnaire (Gonzalez et al., 2012; Rippeth et al., 2004), a detailed semi-structured interview using retrospective self-report to gather information on the frequency and quantity of use of 16 drug classes. Drugs assessed in this semi-structured questionnaire included alcohol, nicotine, cannabis, and regulated drugs such as, synthetic cannabinoids (e.g., K2, spice), cocaine, methamphetamine, other stimulants, heroin, opiates, benzodiazepines, barbiturates, ecstasy, hallucinogens, other club drugs, phencyclidine (PCP),