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Initiation of vaporizing cannabis: Individual and social network predictors in a longitudinal study of young adults

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ABSTRACT

Background: A trend has recently emerged of individuals using electronic nicotine delivery systems (ENDS) or similar devices to vaporize cannabis, either in the form of high-potency THC concentrates or cannabis plant material. Peer use is central to the adoption of substance use behaviors in young adulthood, but little is known about peer influence for initiating cannabis vaping.

Methods: A longitudinal investigation of first-year college students (N = 1313) using social network methods was conducted to determine the prevalence of vaping cannabis, differences in networks between individuals who initiate vaping cannabis, and predictors of initiation of vaping cannabis across two time points. The surveys were available for two weeks beginning in the sixth week of each semester.

Results: We found that 9.4% vaped in their lifetime but not since the first survey, 7.5% vaped in their lifetime and since the first survey, and 5.9% reported vaping cannabis at the second survey. Lifetime cannabis use, lifetime ENDS use, and number of peers who initiated vaping cannabis from Time 1 to Time 2 were significantly associated with increased odds of the initiation of vaping cannabis; the number of any-cannabis-using or any-ENDS-using peers was not associated with increased odds of initiating vaping cannabis.

Conclusions: Individuals with the greatest risk of initiation of vaping cannabis during the first year of college are those with a prior history of other cannabis use and ENDS use and who have peers in their network who initiate cannabis vaping.

1. Introduction

The proliferation of electronic nicotine delivery systems (ENDS) has introduced a generation of young people to a new method of ingesting nicotine that does not require combustion. These devices, which heat a liquid that typically contains nicotine and flavorings to an inhalable aerosol, have become popular among young people (Johnston et al., 2017). As of 2015, ENDS (also called e-cigarettes or "vapes") were the most commonly used tobacco product by youth (Singh et al., 2016). The long-term health effects of these products are currently unknown, and more disturbingly, there is evidence that use of these products by never-smoking adolescents increases the risk of initiating traditional cigarette smoking in adolescents and young adults (Leventhal et al., 2015; Loukas et al., 2018; Soneji et al., 2017; Spindle et al., 2017).

As young people have adopted these devices for vaping nicotine, a growing trend has emerged in which individuals use their ENDS to ingest cannabis via THC-containing wax (e.g., 'dabs'; Daniulaityte et al., 2015), oil, or by using similar portable devices that heat ground cannabis plant material without burning it to produce a vapor (Giroud et al., 2015; Kenne et al., 2017; Loflin and Earleywine, 2014). In both adults and adolescents, prevalence of having ever vaped cannabis among ever-users of e-cigarettes and ever-users of cannabis was about 18%, and a strong predictor of this behavior was frequent use of ENDS. In adults, a relationship was found between greater rates of impulsivity and ever-vaping of cannabis (Morean et al., 2015; Morean and L'Insalata, 2017). In a young adult general population sample of both smokers and non-smokers, 29% had ever vaped cannabis, and this behavior was associated with male gender, nicotine-containing ENDS use, and heavier current cannabis use (Jones et al., 2016). Recent studies have shown that about 7–29% of college students have used an e-cigarette for cannabis or other non-nicotine drug vaping (Frohe et al., 2018; Kenne et al., 2017). However, these studies were cross-sectional, which does not allow for an investigation into the stability of this behavior over time or to study predictors of initiation.

Traditional vaporizers for cannabis, which heat the plant matter itself without burning it, have existed on the market for several years (Hazekamp et al., 2006). However, they have not garnered as much attention as more novel forms of vaping cannabis, which typically

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require a processed marijuana concentrate such as wax, oil, or liquid that can be used in ENDS (Daniulaityte et al., 2017). Unlike modern vapes, traditional vaporizers were generally larger, tabletop devices that were not portable and were typically more expensive relative to the more popular joints, pipes, and blunts, making them less appealing to young people (Johnson et al., 2016). Recently, however, in the wake of increasing of ENDS use among youth, pen-style vaporizers which require only ground cannabis buds have become more popular. Whereas vaping ground plant material has been shown to reduce respiratory symptoms relative to traditionally smoking cannabis (Earleywine and Barnwell, 2007), there is debate about whether vaping cannabis via wax or oil in an ENDS does in fact meaningfully reduce respiratory harms (Budney et al., 2015; Tashkin, 2015). Further, use of cannabis oil that has been extracted via butane heating can contain very high amounts of THC, and use of this type of oil has been associated with greater reports of cannabis-related harms in young people (Meier, 2017; Chan et al., 2017). Recent studies suggest that dual cannabis and ENDS use is associated with increased risk of heavier use of both cannabis and ENDS in adolescents, though the authors were not able to report whether the ENDS devices were being used to vape nicotine or cannabis (Dai and Hao, 2017). Thus, concern is mounting that ENDS and similar products may not only provide a gateway to cigarette smoking but also to increased cannabis use among young people and the potential for exposure to more harmful THC concentrations (Borodovsky et al., 2017; Blundell et al., 2017).

Vaping cannabis may become increasingly popular for youth relative to smoked cannabis for a number of reasons. One such reason is by providing a discreet method of administration that can be used in places where smoking of any kind is not allowed, as vaping cannabis produces very little visible vapor, the aroma is greatly reduced relative to traditional smoking, and vape pens do not resemble traditional joints or bowls used for smoking cannabis (Malouff et al., 2014). Further, vaping cannabis may be perceived as less harmful than smoking cannabis by burning it through a pipe or in a joint (Etter, 2015; Morean et al., 2017). Overall, the increasing trend of cannabis vaping in youth may be due to factors that are relatively distinct from the factors which contribute to cannabis use generally and therefore needs to be studied as a specific category of behavior.

Young adulthood, and particularly the early college years, is a critical developmental period in the initiation of drug use (Stone et al., 2012). A crucial risk factor for substance use initiation and progression in adolescence and young adulthood is peer substance use (Alexander et al., 2001; Mason et al., 2014), and peer use becomes an especially strong predictor in young adulthood (Van Ryzin et al., 2012) as friendship networks replace family networks as a source of everyday interactions. However, random sampling can mask the effects of peers and the influence of networks on behavior, through which new behaviors, such as vaping, can diffuse (Borgatti et al., 2009; Andrews et al., 2002). Longitudinal social network methods have made more nuanced analysis of the diffusion of drug use norms and behaviors through a peer network possible, allowing for more precise identification of social relationship factors that are both predictive of and protective against drug use (Valente and Pitts, 2017). In the case of cannabis vaping, a relatively novel phenomenon, having social contact with others who engage in this behavior may greatly increase the risk that a given individual will initiate this behavior.

A recent study with adolescents found that ever use of cannabis and e-cigarettes were both associated with vaping cannabis (Morean et al., 2015); we therefore included these variables as individual predictors of cannabis use initiation in the current study. Further, sensation-seeking, a measure of impulsiveness, has been associated with the initiation of cannabis use (Haug et al., 2014) and cannabis vaping specifically (Morean et al., 2017). Thus, we also sought to determine the role of this variable in predicting cannabis vaping initiation. Finally, the university at which this study was conducted allows students living on-campus to opt-in to living in a “substance free” dormitory in which students agree to live in an environment free of alcohol or other substance use; thus, we also wished to determine if these students were less likely to initiate this specific type of drug use.

The aims of the current study were to determine 1) the prevalence of vaping cannabis, 2) differences in social networks between individuals who initiated vaping cannabis across the first year of college and their peers, and 3) individual-level predictors and network-level of initiation of vaping cannabis. We further 4) compared the findings on predictors of cannabis vaping to predictors of initiation of any ENDS use generally in order to determine whether these behaviors share similar or different risk factors and 5) examined whether cannabis vaping was associated with an increase or decrease in frequency of cannabis use overall (i.e., to determine if participants are vaping instead of smoking). We hypothesized that risk for initiation of cannabis vaping would be highest among ever-users of either substance (ENDS and cannabis), and that overall network exposure to these substances would be predictive of vaping cannabis at any time point and of initiation of vaping cannabis during the first year of college.

2. Materials and methods

2.1. Procedure

During the fall 2016 semester at a mid-size Northeastern university, all incoming first-year students living on-campus were eligible to participate in the larger study from which these data were drawn. Students in a program for returning (not traditional age) students or not living on campus (n = 14) and first-year students enrolled in a dual-degree program with another local institution (n = 18) were deemed ineligible. This left a total of 1660 students who were eligible to participate. A variety of advertising strategies were used to facilitate enrollment of a large proportion of the incoming first-year class. Matriculating students were sent post-cards and e-mails and were encouraged to participate through on-campus advertising (e.g., flyers, in-person tabling events). Prior to the first survey, students were sent a link to an online study consent form. Students 18 or older provided consent to participate. Students who were under the age of 18 provided assent, and through our online system they emailed a link to a parent or guardian who provided consent.

The first and second waves of the web-based survey were available for two weeks beginning in the sixth week of the Fall 2016 (Time 1) and Spring 2017 (T2) semesters. Surveys took an average of 45 min to complete and assessed a variety of substance use behaviors and related variables. Surveys also contained a series of questions to characterize participants’ ties within the complete sociocentric network of first-year students. Participants received electronic Amazon gift cards via email in the amounts of $50 and $55 for completing T1 and T2 surveys, respectively. Among the 1660 eligible first-year students living on-campus, 1342 (81%) completed the first survey in the Fall 2016 semester. A majority of these students (n = 1313; 98%) also completed the second survey in the Spring 2017 semester and are included in these analyses. An analysis of the 29 participants who did not complete the T2 survey revealed that they consumed a higher number of drinks on their heaviest drinking day (M = 6.68 vs. M = 4.53, t(1327) = −2.57, p = .01); no other differences were found. To protect participant confidentiality, participants were assigned a unique ID number which was used to identify them from T1 to T2. Survey data were collected online using Illume (version 5.0; DatStat Inc.). Data were stored securely on a University server using secure sockets layer (SSL) encryption and firewalls to protect the data and prevent unauthorized access. All procedures were approved by the University’s Institutional Review Board.

2.2. Measures

2.2.1. Demographics

Participants self-reported their age, sex, race, ethnicity, athlete