



Full length article

## Distinguishing subpopulations of marijuana users with latent profile analysis



Matthew R. Pearson<sup>a,\*</sup>, Adrian J. Bravo<sup>a</sup>,  
Bradley T. Conner<sup>b</sup>, Marijuana Outcomes Study Team<sup>1</sup>

<sup>a</sup> Center on Alcoholism, Substance Abuse, and Addictions, University of New Mexico, 2650 Yale Blvd SE, Albuquerque, NM 87106, United States

<sup>b</sup> Department of Psychology, Colorado State University, 1876 Campus Delivery, Colorado State University, Fort Collins, CO 80523-1876, United States

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### ABSTRACT

**Background:** Although marijuana is the most commonly used illicit drug in the United States, little is known about the effects of typical marijuana use patterns and whether there are distinct subgroups of marijuana users.

**Methods:** The present study used latent profile analysis to determine the number of distinct subgroups of marijuana users in a large sample of college students ( $n=2129$  past month marijuana users across 11 universities). We also examined how these distinct groups differ on several putative risk/protective factors (e.g., personality traits, perceptions of marijuana, and motives for using marijuana).

**Results:** Using the Lo-Mendell-Rubin Likelihood Ratio Test, we identified four latent classes with the largest class consisting of infrequent marijuana users, and three other classes demonstrating increasingly frequent use and more negative consequences with the most severe class being the smallest class. We found the largest between-class differences (i.e., distinctions across classes) to be on identification with being a marijuana user and use of protective behavioral strategies (PBS), such that the heavier user classes showed higher identification with marijuana users and lower use of PBS.

**Conclusions:** Our findings demonstrate that college student marijuana users are a heterogeneous group with different profiles of risk/protective factors and that those who use marijuana a few times per month are different from those who are near-daily or daily users. Our findings also serve as a call to action for the field to consider examining identification with being a marijuana user and the use of PBS in future marijuana studies.

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\* Corresponding author at: Center on Alcoholism, Substance Abuse, & Addictions, University of New Mexico, 2650 Yale Blvd SE MSC 11-6280, Albuquerque, NM 87106, United States.

E-mail address: [mateo.pearson@gmail.com](mailto:mateo.pearson@gmail.com) (M.R. Pearson).

<sup>1</sup> This project was completed by the Marijuana Outcomes Study Team (MOST), which includes the following investigators (in alphabetical order): Amber M. Anthenien, University of Houston; Adrian J. Bravo, University of New Mexico; Bradley T. Conner, Colorado State University; Christopher J. Correia, Auburn University; Robert D. Dvorak, University of Central Florida; Gregory A. Egerton, University at Buffalo; John T. P. Hustad, Pennsylvania State University College of Medicine; Tatyana Kholodkov, University of Wyoming; Kevin M. King, University of Washington; Bruce S. Liese, University of Kansas; Bryan G. Messina, Auburn University; James G. Murphy, The University of Memphis; Clayton Neighbors, University of Houston; Xuan-Thanh Nguyen, University of California, Los Angeles; Jamie E. Parnes, Colorado State University; Matthew R. Pearson, University of New Mexico; Eric R. Pedersen, RAND; Mark A. Prince, Colorado State University; Sharon A. Radomski, University at Buffalo; Lara A. Ray, University of California, Los Angeles; Jennifer P. Read, University at Buffalo.

### 1. Introduction

Increasing evidence suggests that heavy, chronic, and early onset marijuana use has a wide range of long-term negative consequences including cannabis use disorder (CUD), cognitive impairment, lower achievement, and poor educational outcomes (Volkow et al., 2014). With the trend towards decriminalization and legalization of marijuana use across the country (Pacula and Sevigny, 2015), the availability of marijuana and perhaps use of marijuana is likely to increase. Given this landscape, it is important to identify risk factors associated with heavy and problematic (i.e., associated with negative consequences) marijuana use (Simons et al., 2012). Although data from large epidemiological studies (e.g., Monitoring the Future, Johnston et al., 2015; National Survey of Substance Use and Health, Center for Behavioral Health Statistics and Quality, 2015) demonstrate that chronic marijuana use is associated with various psychosocial and medical problems, many questions still remain. For example, much less is known about

the effects of typical marijuana use patterns and whether there are distinct subgroups of marijuana users.

Although variable-centered analyses (e.g., multiple regression, structural equation modeling) predominate the marijuana literature, they are limited in that they tend to focus on the unique associations between marijuana use and associated outcomes as well as only comparing users to non-users. Further, variable-centered approaches assume that all participants have been sampled from a single population (i.e., population homogeneity assumption; Collins and Lanza, 2010). The limitations of variable-centered analyses can be overcome through the use of person-centered analyses. Person-centered analyses can identify subpopulations, or subgroups, of individuals who share particular attributes. For example, there has been a plethora of person-centered research identifying distinct subpopulations of users for various drugs including: tobacco (Sutfin et al., 2009), MDMA/ecstasy (Carlson et al., 2005), alcohol (Reboussin et al., 2006), and opioids (Monga et al., 2007).

There have been several studies utilizing person-centered analyses in the examination of marijuana users among adolescents (Eassey et al., 2015; Hix-Small et al., 2004; Windle and Wiesner, 2004) and emerging/young adults (Arria et al., 2016; Brook et al., 2011; Brown et al., 2004; Caldeira et al., 2012; Ellickson et al., 2004; Jackson et al., 2008; Juon et al., 2011; Schulenberg et al., 2005; Tait et al., 2011). Using group-based trajectory approaches, these studies typically identified 3 to 5 groups of marijuana users: abstainers, increasing users, daily users, and, in some cases, experimental and decreasing users. Further, researchers were able to identify several variables that were predictive of these distinct marijuana users, some acting as risk and some as protective factors. For example, Eassey et al. (2015) found that for each trajectory group, parental disapproval of substance use and associating with non-using peers demonstrated significant protective effects on the frequency of marijuana use. Less exposure to peer pressure was associated with lower frequency of marijuana use for the increasing and chronic trajectory groups, whereas school attachment had a protective effect for only those in the chronic use trajectory group. As most of these previous studies have come from large, longitudinal epidemiological studies, they have a strength in being from nationally representative samples that capture change over time (i.e., trajectories) of these marijuana users.

The studies mentioned above predominately used a single indicator of marijuana frequency as the key indicator for their distinct classes, while ignoring other key variables, such as experiences of marijuana-related negative consequences. From a public health perspective, experience of marijuana-related negative consequences is arguably the most important measure to include, yet none of these studies had a direct measure of marijuana-related negative consequences. By including experiences of marijuana-related negative consequences as an indicator, researchers may be able to further distinguish marijuana users beyond just frequency of use (e.g., a subclass of moderate marijuana users without problems). Such knowledge gains can help improve upon existing treatment of CUD (Davis et al., 2015) as well as policies surrounding the regulation of marijuana use (Room, 2014).

According to the National Survey of Substance Use and Health (NSDUH), the peak period of marijuana use occurs between the ages 18 and 25 years old (Center for Behavioral Health Statistics and Quality, 2015), which is also the age of most college students in the United States (Kena et al., 2015). Thus, college students are an important group to study with regards to examining if there is heterogeneity among marijuana users based on not only frequency of use but also experiences of marijuana-related problems.

### 1.1. Purpose of study

The purpose of the present study was to identify subpopulations of marijuana users defined by both marijuana use frequency and experiences of marijuana-related negative consequences. Specifically, we used latent profile analysis to determine the number of distinct subgroups of marijuana users in a large sample of college student past month marijuana users collected from 11 different universities. Latent profile analysis is a person-centered statistical technique that assumes that the pattern of means on observed variables can be accounted for by the existence of distinct latent classes, or distinct classes of individuals in terms of their level of marijuana involvement. One of the strengths of latent profile analysis relative to other person-centered approaches (e.g., cluster analysis) is that latent class membership is considered to be probabilistic and the size of classes is taken into account when assigning probabilistic class membership. Although we had no *a priori* hypotheses regarding how many latent classes we would find, we expected that there would be at least one latent class of low frequency, marijuana users and one latent class of heavy, problematic users. To determine the most salient factors that distinguished lower vs. higher marijuana involvement classes, we examined how these distinct classes differed on a host of risk and protective factors that have been linked to marijuana use, such as personality traits (Cyders and Smith, 2007; Galbraith and Conner, 2015; Whiteside and Lynam, 2001; Woicik et al., 2009), perceptions of marijuana use (Napper et al., 2015; Swaim, 2003), motives for using marijuana use (Simons et al., 1998), use of protective behavioral strategies (Pedersen et al., 2016), and difficulties in emotion regulation (Gratz and Roemer, 2004).

## 2. Method

### 2.1. Participants and procedure

College students ( $n=8141$ ) were recruited from Psychology Department Participant Pools at 11 participating universities in 11 different states (Washington, California, Wyoming, Colorado, New Mexico, North Dakota, Kansas, Texas, New York, Virginia, Alabama) in the United States between Fall 2015 and Spring 2016. Participants read an informed consent prior to completing the main survey online (~45–60 min to complete), and were awarded research participation credit. This research was approved by the institutional review board at each participating university. Additional information about this sample is reported elsewhere (Pearson et al., 2016). For the present study and given our primary concern of identifying the heterogeneity among current marijuana users, our analyses were restricted to participants who reported using marijuana in the past month ( $n=2129$ ). Among current marijuana users, the majority of participants identified as being either White, non-Hispanic ( $n=1285$ ; 60.4%), or of Hispanic/Latino ethnicity ( $n=390$ ; 18.3%), were female ( $n=1260$ ; 59.2%), and reported a mean age of 19.95 ( $SD=3.66$ ) years.

### 2.2. Measures

**2.2.1. Marijuana involvement indicators.** To determine lifetime marijuana user status, we asked, “In your lifetime, have you ever used marijuana in any form?” If participants responded with “yes,” they were branched to two additional questions: 1) “Approximately how many days in your lifetime have you used marijuana?”, and 2) “On how many days during the last 30 days did you use marijuana?” If participants responded with 1 or greater to this second question, they were then asked the remainder of the marijuana-related questions.

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