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Special Section Editor
Benjamin O. Ladd, Ph.D.

KEYNOTE ADDRESS

Cognitive Behavioural Interventions for Cannabis Use Disorder: Timing, Technologies, and the Potential for Adjunctive Cannabinoid Replacement?
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Communicating about Cannabis: Safe, High Risk, Therapeutic, Cannabinoids, Evidence

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POSTER PRESENTATIONS

All poster presentations and symposia were peer-reviewed by the 2019 Conference Program Committee of the Research Society on Marijuana (RSMj) (Co-chairs: Bradley T. Conner, Colorado State University, Benjamin O. Ladd, Washington State University Vancouver, Kristina T. Phillips, University of Northern Colorado). All abstracts below were approved and voluntarily submitted for publication in Cannabis by the presenting or contact author.

The Alcohol Policy Information System (APIS) as a Tool for Studying Effects of Cannabis Policy

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As of January 1, 2018, eight states and the District of Columbia (henceforth "states") had legalized recreational cannabis use for adults to varying degrees. Although these states often get studied together, there are differences in their policy provisions, their processes for legalization, and their regulatory structures for the cannabis industry. These differences may lead to differences in health-related behaviors and outcomes related to cannabis. To better understand the effects of legalization and its variations, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) recently expanded the Alcohol Policy Information System (APIS) to include recreational cannabis laws for all states. This poster provides: 1) an overview of the cannabis laws and regulations covered by APIS; 2) descriptions of analyses that can be performed and research questions that can be addressed using APIS data; and 3) an example

analysis using APIS data of the effects of policies toward home delivery of cannabis products on use of cannabis by youth. The APIS database provides in-depth comparisons of state and Federal laws on selected alcohol- and cannabis-related topics with exact effective dates and supplemental information useful to researchers interested in alcohol and cannabis policy. Data on recreational cannabis policies cover laws and regulations effective on or after January 1, 2012, encompassing 21 specific variables in four policy topic areas: 1) cannabis product control; 2) taxation, fees, and pricing; 3) advertising, marketing, and mass media; and 4) transportation, crime, and public safety. APIS facilitates valid cross-sectional and longitudinal comparisons of state alcohol and recreational cannabis policies, providing researchers with the basis for a wide range of analyses of policy effects and effectiveness. Researchers can conduct before-and-after studies of the impact of a specific law in one or more states; difference-in-difference analyses comparing the impact of a specific law enacted in some states to other states where the law was not enacted; or cross-sectional analyses comparing cannabis laws across all states or comparing policies addressing recreational cannabis to those pertaining to alcohol. This poster outlines the broad range of research opportunities available using APIS data. To illustrate the kinds of research that APIS data on recreational cannabis can support, we present a sample analysis exploring policy effects on youth cannabis use. APIS documents whether states that have legalized recreational cannabis also permit or prohibit the delivery, after sale, of recreational cannabis products to customers who are not physically present at a retail outlet. Like home delivery of alcohol, home delivery of cannabis may increase availability to youth by increasing opportunities to evade minimum age purchase requirements. We use data from the Youth Risk Behavioral Surveillance System (YRBSS) in conjunction with policy information from APIS to analyze the effects of home delivery policies on cannabis use by high school students. This poster will summarize the design, methods, and findings from that analysis to illustrate how APIS can support studies of the effects of changing cannabis policies on behaviors and outcomes of public health importance.

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Factors Related to Increasing Marijuana Use in the US between 2008-2009 and 2016-2017

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Marijuana use is on the rise in the US, but not uniformly so. To examine factors related to increasing marijuana use over the past decade, we examined state-level data from the National Survey of Drug Use and Health (NSDUH) from the 2008-2009 and 2016-2017 biennia. Derived from annual NSDUH data, estimates of the percentage of the US population self-reporting any recent marijuana use were published by the Substance Abuse and Mental Health Survey Administration, stratified by biennium, state, age group (12-17, 18-25, or ≥26 years), and time frame (past 30 days, past year). Additionally, we stratified the data according to state marijuana legalization status as of 2016 (legal medical and nonmedical use, legal medical use, legal non-euphoriant use, or no legal use). Multivariate analysis of variance was conducted with the states and the District of Columbia as subjects (N=51), legalization status and region as between-subjects factors, and time frame, age group, and biennium as within-subjects factors. A full factorial model was examined and estimated marginal means were examined. Results indicated main effects for all factors except region. As hypothesized, all else being equal, the proportion of the population reporting recent marijuana use increased significantly from the 2008-2009 biennium (13.4%) to the 2016-2017 biennium (16.3%). Also consistent with hypotheses, across biennia, rates of marijuana use were highest among those aged 18-25 years (26.2%) and in states with legal medical and nonmedical use (19.5%) and lowest among those aged ≥26 years (8.3%) and in states with no medical use (11.9% and 12.7%). These main effects were qualified by several two- and three-way and a four-way interaction between biennium age group, legalization status, and region. Notably, no significant increases were observed among those aged 12-17, regardless of state legalization status. Among 18-25 year-olds and those 26 and older, increases in marijuana use in states with legal nonmedical use outpaced

those in states without such use. This poster will fully present these interactions as well as differential individual-level data from the NSDUH between the two biennia.

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Age-Related Differences in Cannabis Product Preference

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Examining age-related differences among cannabis users and their product choices could help target prevention and treatment efforts in specific populations. In the present study, we examined use and purchase habits of current cannabis users (N=1500; 70.3% female) residing in metro areas where recreational marijuana has been legalized.

Analyses showed significant differences in product preference depending on participants' age, which was split into 6 groups (18-24, 25-34, 35-44, 45-54, 55-65, 65+). All groups reported loose flower as their most commonly used product, with 62.7% of participants endorsing use, followed by edibles (55.6%) and pre-rolled joints (41.7%). The 18-24 age group was more likely to use pre-rolled joints ($\chi2$ (5, N = 1500) = 89.6, p < .001), edibles ($\chi2$ = 26.08, df = 5, p < .001), dry vaporizers ($\chi2$ = 40.64, df = 5, p < .001), oil/wax vaporizers ($X2$ = 43.85, df = 5, p < .001), and dabbing ($\chi2$ = 87.15, df = 5, p < .001); while the 25-24 age group had the highest use of loose flower ($\chi2$=20.25, df = 5, p <.01). A majority of participants (over 50%) at every age group, with the exception of 65+ year-olds, used loose flower. Both 25-34-year-olds and 18-24-year-olds were over twice as likely to use loose flower products than the 65+ age group (ORs: 2.28, p < .001 and 2.01, p < .01, respectively). The 65+ year-olds also reported higher rates of use of loose flower than any other product (48.4%), despite having the lowest use rate of all age groups. A majority of participants in every age group also consumed edibles, except for those 55-65 and 65+, with the 18-24 age group 2.6 (p < .001) times more likely to currently use edibles than the 65+ group. Younger participants

were also more likely to use pre-rolls than the oldest participants, with the 18-24, 25-34, and 35-44 age groups (ORs: 5.98, 4.7, and 3.45, p < .001) showing the greatest difference. Dabbing, or the flash vaporization of marijuana concentrates (i.e. wax, shatter, etc.), was unique in that this kind of use was more common (between 25-29%) among the youngest age groups (18-24, 25-34, and 35-44-year-olds), but occurred in less than 10% of the older age groups (45-54, 55-65, and 65+). The youngest (18-24) age group was almost 17 times more likely to endorse dabbing than the oldest group (OR:16.94, p < .001), while the 25-34 and 35-44 groups were almost 14 times more likely to do so (ORs: 13.87 and 13.88, p < .001). Tinctures ($\chi2$ = 4.52, df = 5, p = .477), cannabis-infused topicals ($\chi2$ = 7.42, df = 5, p = .191), and ingestible oils ($\chi2$ = .95, df = 5, p = .967) did not vary with age, perhaps because they had the lowest overall rates. Taken together, these findings suggest that younger and older cannabis users use different types of cannabis products. Intervention efforts for higher risk populations might benefit from targeting the products most likely to be used among those groups.

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Cross-Cultural Examination of College Marijuana Culture in Five Countries

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Marijuana internalized norms have been found to be a more robust predictor of alcohol use/ outcomes in college students than either marijuana descriptive norms or marijuana injunctive norms. The Perceived Importance of Marijuana to the College Experience Scale (PIMCES) has similarly found that marijuana internalized norms are a more robust predictor of marijuana related use/ outcomes among college students. These marijuana normative perceptions have not yet been assessed in countries outside of the US, which may vary based on marijuana legalization status and cultural differences. In the

present study, we sought to examine whether the PIMCES could be used to accurately assess marijuana internalized norms cross-culturally, across sex, and users/non-users looking at 5 different countries. We wanted to determine the degree to which college students perceive marijuana to be an important part of the college experience across these same variables. Lastly, we wanted to examine the construct validity of the PIMCES to determine the degree to which the associations between marijuana internalized norms and marijuana-related outcomes are similar/different. We assessed (n=3,424; 68.0% female) college students from 8 different universities across 5 different countries (US, Uruguay, Argentina, Spain, and Netherlands). We found strong measurement invariance for the PIMCES across countries, across males and females, and across marijuana users and nonusers. Compared to college students from all other countries, college students in the U.S. reported the highest levels of marijuana internalized norms. Males and marijuana users showed significantly higher scores on the PIMCES than females and non-users, respectively. Bivariate correlations between PIMCES scores and other marijuana-related variables were similar across males and females, though differences across countries warrant further exploration.

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Marijuana Use Patterns among Young Adults

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Purpose: Marijuana use has been slowly, but steadily increasing, among young adults (MTF, 2018); with daily or near daily use, at an all-time high with 13.2% of young adults using regularly and perceptions of risk from regular marijuana use decreasing. While most epidemiological studies focus on prevalence of use, little is known about patterns or frequency of use within a day or week. Increased knowledge of young adults' frequency of marijuana use, including the days per week and number of times per day, and when they use (e.g., morning, afternoon, evening) will help guide intervention efforts. The present study assessed the current patterns of marijuana use (e.g., time(s) of day, day(s) of the week) of a sample of young adults who reported marijuana use in the past week. Method: Participants included a subsample of young adult drinkers and marijuana users (N=308; 48.4% female, Mage=21.61, SD=2.14) who were part of a larger longitudinal daily study on health behaviors. Participants reported drinking at least three times in the past month, simultaneous alcohol and marijuana use at least once in the past month, and marijuana use at least once in the past week. Data for present analyses come from the baseline survey where participants were asked to think about their marijuana use each day in the past week and indicate for each day the time(s) of day they used marijuana. Each day, participants endorsed three-hour time blocks (e.g., 6pm to 9pm, 9pm to midnight) for use. For the purposes of this analysis, the number of endorsed days was summed (0 to 7) and the number of time blocks on any given day was summed (0 to 8). Results: Frequencies were performed to determine the least and most popular days and time frames of marijuana use. Marijuana use varied across the past week with Monday the least popular day to use (59%) and Friday the most with over 80% of the participants using marijuana. Over 80% of participants used marijuana between 9pm and midnight on any given day with the second most popular time frame 6pm to 9pm. Nearly 65% of participants used marijuana on Fridays and Saturdays between 6pm to 9pm. On average, participants used marijuana 4.76 (SD=2.27) days in the past week and 3.33 (SD=1.78) time blocks per day with 42.5% of participants using marijuana every day in the past week, 86% in more than one time block on any one day, and 41.2% using marijuana more than once every day in the past week. Conclusions: With the increase of daily, or near daily, marijuana use improved understanding of marijuana use among young adults is beneficial for interventions and public health messaging. Knowledge of marijuana use patterns, including day(s) of the week, time(s) of day, and frequency of use, can help discern if certain use patterns are more indicative of use disorders, health issues, and/or associated with negative consequences. With this in mind, future research should examine young adults' marijuana

use patterns and potential associated consequences and health issues.

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An Alternative Option: Cannabis substitution decreases other drug use following recreational legalization

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Previous research demonstrates that many medical cannabis users substitute cannabis for other drugs, emphasizing perceptions of the plant's improved efficacy and side effect profile. In the present study, we examined cross-sectional, retrospective data from the Spring 2018 High Yields Insight survey to determine if changes in cannabis legalization across states produced reported decreases in other drug use (N=1500, 70.33% female, mean age=35-44). Specifically, we examined consumption differences in spirits, wine, beer, diet medication, over-the-counter (OTC) sleep medication, OTC pain medication, prescription sleep medication, prescription pain medication, prescription depression medication, and prescription anxiety medication. Additionally, all changes in use were totaled for a single use index variable. Our findings revealed that decreases in other drug use were associated with frequency of cannabis use (Spearman's rho=-.119, p<.05), and positively covaried with support for legalization (Spearman's rho=.250, p<.01). A series of t-tests from 0, with an applied Bonferroni correction, demonstrated use significantly decreased for each drug (t values ranged from -9.5 to -23.18, p<.001). Effect sizes were moderate to large, ranging from -.31 to -.71. Finally, decreases in the index of all other drug use were independent of gender, education, race, cannabis use, medical/recreational user status, and legalization attitudes (F(27, 273)=1.008, p>.05). Taken together, these results suggest that cannabis legalization potentially decreases self-reported retrospective use of other drugs for a diverse range of users. These results justify continued research on cannabis substitution, including randomized controlled trials, given its

potential to decrease consumption of more harmful and addictive drugs.

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Marijuana and Alcohol Use Patterns across Education Levels

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Marijuana and alcohol are the two most commonly used substances among young adults (18-25 years old) and are associated with acute negative consequences and risk for longer-term developmental and health effects (NIDA, 2018). With the majority of research and intervention efforts focusing on 4-year college students, much less is known about young adults who are (a) attending 2-year colleges, (b) not currently in school and have not earned a 2- or 4-year degree, and (c) not currently in school but have earned a postsecondary degree. Notably, 2017 Monitoring the Future data showed nearly three times as many non-students reported using marijuana on a daily basis than those attending a 2- or 4-year college. The present study examines differences in weekly marijuana and alcohol use among young adults across different levels of education. Participants included a subsample (n=720) from a larger study on health behaviors, aged 18 to 24 (Mage=20.54, SD=1.690, 54.9% female). Participants reported drinking at least once in the past year and were categorized into one of four education categories: 4-year students (n=354), 2-year students (n=167), non-students without a 2- or 4-year degree (n=73), and non-students with a postsecondary degree (n=126). Participants completed measures assessing typical weekly marijuana and alcohol use in the past month. Analysis of covariance (ANCOVA) was conducted separately for typical weekly marijuana and alcohol use, controlling for age and biological sex. Over 77% of the sample reported lifetime use of marijuana. Of the four groups, non-degreed non-students were at greatest risk of marijuana use. Specifically, non-degreed non-students used marijuana more days in a typical week (M=2.90) and were high more hours in a typical week (M=17.68) than both 4-year students (M=1.41;

M=4.59) and degreed non-students (M=1.30; M=5.78); 2-year students were high more hours (M=10.33) than 4-year students. In addition, non-degreed non-students were high more hours per week (M=17.68) than 2-year students (M=10.33). Non-degreed non-students reported being high for significantly more hours than all other groups every day of the week except for Thursdays and Fridays when they were high longer than 4-year and degreed non-students but not 2-year students. Similarly, 2-year students reported being high significantly more hours than 4-year students every day of the week. For alcohol use, findings indicated 4-year students reported drinking significantly more drinks per week (M=7.27) than 2-year students (M=3.74). Non-degreed non-students (M=1.93) and 4-year students (M=1.91) drank significantly more days per week than 2-year students (M=1.41). On Thursdays, Fridays, and Saturdays, 4-year students reported consuming significantly more drinks than 2-year students and, on Fridays, more than non-degreed non-students. However, non-degreed non-students drank more than 4-year students and degreed non-students on Sundays. 2-year students and non-students, in particular non-students without a 2- or 4-year degree, appear to be at high risk for marijuana use compared to 4-year students; though different patterns are found for alcohol. Due to different substance use patterns, young adults across different education levels may warrant different interventions with specific efforts made to reach 2-year students and those not attending college.

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Marijuana Content on Twitter and Marijuana Use among Teens

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Background: Digital media have become an important channel for marijuana marketing and consumer engagement. Marijuana dispensaries and retail outlets advertise a broad range of products and devices on social media, employing marketing strategies that attract youth such as recruiting celebrity enthusiasts and musicians for product promotion. Also regular people express behavioral intentions, opinions, and beliefs about marijuana on social media. Many such messages portray positive sentiment and normalization of marijuana use, and youth culture with memes and cartoon images. While marijuana-related posts certainly reflect marketing and community norms, to date, there is scant evidence about whether the marijuana-related digital media environment is associated with marijuana use, especially among young people. We analyzed the association between marijuana-related posts on Twitter and marijuana use among youth. Method: Marijuana-related tweets were geolocated at the state-level and linked with state-level prevalence of youth marijuana use. We obtained the state-level prevalence of past 30-day marijuana use among 12-17 year olds, which were estimated using individual-level data from the 2015-2017 National Survey on Drug Use and Health (NSDUH). Tweets were collected using search queries that included language related to marijuana use, blunt smoking, and associated marketing accounts from Gnip's Historical PowerTrack. About 35% of retrieved and relevant tweets were geolocated to U.S. states based on tagged locations and location information extracted from user profiles. Sentiment of tweets was assessed using VADER, giving a score between -1 (highly negative) and 1 (highly positive) for each tweets, and averaged within states. Result: Average sentiment scores of marijuana tweets ranged from -0.06 to 0.04 across states and were positively correlated with state-level prevalence of youth marijuana use (r=0.61, p<.0001). Average sentiment scores of blunt-related tweets ranged from -0.025 to 0.075, indicating more positive sentiment toward blunt than marijuana, and were also positively correlated with prevalence of youth marijuana use (r=0.54, p<.0001). Conclusion: The sentiment of marijuana-related posts at state level is significantly associated with marijuana use among teens. Our findings suggest that the marijuana-related social media environment may reflect and/or influence youth marijuana use at community level. Social media data may be used to supplement survey data or to understand marijuana use behavior measured by survey. Our study is the first step to understand marijuana-related communication environment and its influence on youth marijuana use. Future research is needed to examine the relationship at

granular level, such as individual and smaller geographic units.

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Marijuana Content on Digital Media and Marijuana Use among US Young People

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Background: Digital media have become an important channel for marijuana marketing and consumer engagement. Marijuana dispensaries advertise a broad range of products and devices on social media, employing marketing strategies that attract young people such as recruiting celebrity and musicians for product promotion. Also regular people search for marijuana-related information online and express behavioral intentions, opinions, and beliefs about marijuana on social media. Many such messages portray positive sentiment and normalization of marijuana use. The aggregation of these marijuana-related searches and posts reflect both community norms and marketing activities. However, to date, there is scant evidence about the relationship between marijuana-related digital media environment and actual marijuana use, especially among young people. We explored whether marijuana-related search volume on Google Trends and posts on Twitter are associated with self-reported marijuana use and exposure to marijuana-related information online. Method: A US representative sample of youth and young adults (13-24 years, N=3,884) were interviewed in March-April 2018. Their responses were linked with Google Trends data for "marijuana" search and "cannabis" search for one year prior to the survey (Mar 2017 -Feb 2018) based on Designated Market Area (DMA) they resided in. Marijuana-related tweets posted in Jan -Dec 2017 were collected using search queries that included language related to marijuana and associated marketing accounts. Tweets were geolocated to DMAs based on tagged locations and information extracted from user profiles. Sentiment of tweets were assessed using the VADER sentiment model giving a score between -100 (highly negative) and 100 (highly positive) for each tweets, averaged within DMAs,

and linked with survey data. Result: Youth and young adults living in the DMAs with the highest quartile (top 25%) of "marijuana" or "cannabis" search volume and sentiment score of marijuana-related tweets were more likely to have seen marijuana-related ads, pictures, or videos online or on social media than those living in other DMAs (bottom 75%); 26.7% vs. 17.8% for marijuana search volume, 21.2% vs. 19.4% for marijuana-related tweet sentiment. Based on multivariate analyses, the odds of current marijuana use was 35% greater (OR 1.35, CI 1.13 -1.62) as the search volume increases by one standard deviation (about 13.8 percentage points), controlling for age, sex, race/ethnicity, and household income. The "cannabis" search volume on Google Trends showed similar association with current marijuana use too. In addition, the odds of current marijuana use was 33% greater (OR 1.33, CI 1.12 -1.57) as tweet sentiment score increases by one standard deviation (= 5.4), controlling for the same demographic characteristics. Conclusion: Marijuana-related information-searching and posting are associated with self-reported exposure to marijuana-related content online as well as offline marijuana use. Our findings suggest that the marijuana-related digital media environment may reflect and/or influence exposure to marijuana-related content as well as youth marijuana use among youth and young adults. Digital media data may be used to supplement survey data or to understand marijuana use behavior measured by survey.

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State-by-state Patterns of Marijuana Use Incidence Rates in the US from 2002-2017

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Introduction. The gradual liberalization of marijuana policies in the US increases access to marijuana, which might result in increased risk of first-time marijuana use. As of June 2019, 10 states including Washington D.C. have legalized marijuana for recreational use. In this study, we aim to describe the patterns of marijuana use incidence in the US, state-by-state. We provide

state-specific incidence estimate from 2002-2017. Methods. The study population involves US residents age 12 and older. Included in this study are individuals from the annual cross-sectional National Survey on Drug Use and Health, 2002-2017. The participants were randomly selected to participate through multi-stage probability sampling. After consent, participants responded to audio computerized-assisted self-interviews on drug-related behaviors including the timing of their first-time marijuana use. We used the Restricted-Data Analysis System (R-DAS), an online tool from Substance Abuse and Mental Health Services Administration, to estimate state-specific incidence rates by year-pairs (i.e., 2002-2003 through 2016-2017). We then used Joinpoint regression analysis to determine significant change in the estimated incidence rates over the years. Lastly, we then compared the estimates by aggregating NSDUH data based on the year in which recreational marijuana was first legalized, that is, aggregating the 2002-2013 NSDUH data and the 2014-2017 NSDUH data. Results. Overall, the estimated incidence rate of marijuana use in the US increased from 1.5% (95% CI = 1.4%, 1.5%) in 2002-2003 to 1.8% (95% CI = 1.7%, 1.9%) in 2016-2017. Of the 50 states and Washington D.C., a steady increase in the incidence estimate was observed in 16 states from 2002-2003 to 2016-2017 ($\hat{I}^2>0$; p-value<0.050). A statistically significant decrease in incidence rate was observed in Kentucky from 2002-2003 to 2006-2007 ($\hat{I}^2 = -0.12$; p-value = 0.002) and increased from 2006-2008 to 2016-2017 ($\hat{I}^2 = 0.10$ p-value < 0.001). A statistically significant increase in incidence rate was observed in New Hampshire from 2002-2003 to 2010-2011 ($\hat{I}^2 = 0.13$, p-value = 0.042), with the estimate stabilized from 2010-2011 to 2016-2017. When data were aggregated from 2002-2013, the overall incidence rate estimate was 1.5% (95% CI = 1.5%, 1.6%). Ranked in order, the highest estimated incidence rates are from Rhode Island, Washington D.C., Colorado, Vermont, and Alaska. When data were aggregated from 2014-2017, the overall incidence rate estimate was 1.8% (95% CI = 1.7%, 1.8%). Ranked in order, the highest estimated incidence rates are from Washington D.C., Colorado, Oregon, Washington, and Alaska. Discussion. Our findings suggest an increasing incidence rate of marijuana use in the US. With increased rates of marijuana incidence among several of the 50 states and Washington D.C. since 2002, we expect increased occurrence of consequences of marijuana use (e.g., marijuana-related accidents). General principles indicate close state-level surveillance, primary prevention, and outreach initiatives to reduce the risk of marijuana use and other marijuana-related consequences.

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Survey, Ingestion, or Lab? Examining Differences among Volunteers in Cannabis Research

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Despite efforts to recruit representative samples for research, the potential for bias remains a concern. While previous work demonstrates that volunteers differ from non-volunteers on substance use and sex, less is known about the personality factors and attitudes of participants who volunteer for studies on cannabis. In the present work, undergraduate students (N=308) could volunteer for one of three study options randomly ordered on the university research site: Marijuana Investigation (Ingestion, Survey, or Laboratory). All participants then completed a purported prescreen survey, ostensibly to determine eligibility for the study option they selected. The survey addressed demographic information, cannabis use, sensation seeking (BSSS-8), and research attitudes (RAQ). Participants were also asked about participation in a follow-up study with three potential motivators (to contribute to science, for a prize, and for cash), which was totaled for a single measure of willingness to volunteer. Participants varied in initial selection preference, with the majority choosing the survey option (63.3%), followed by the ingestion (24.7%), and then the laboratory option (12%). Typical cannabis use per week was significantly higher for those who chose the ingestion option compared to the survey option, with the lab option between them but not significantly different from either (F(2, 293)=3.06, p<.05, eta squared=.02). Men and women volunteered at comparable rates for each option. Individuals higher in sensation-seeking and

higher in past month cannabis use were more likely to select the survey condition (ORs: 1.05 and 1.91, respectively, p<.05), while those with positive research attitudes were only .94 (p<.05) times as likely to do so (χ^2 (5, N=280)=14.5 p<.05). Follow-up studies also appealed to different people. Males and higher sensation seekers were more likely to participate in a follow-up study for science (ORs: 2.56 and 1.1 times more likely, respectively), while those with more positive research attitudes were only .778 times as likely (χ^2=65.77, df=6, p<.001). Men were also more likely to participate in a follow-up study for a prize (OR: 2.04). Higher past week cannabis use and research attitudes were only .609 times and .904 times as likely to participate in this follow-up (χ^2=22.05, df=6, p<.01). Similarly, individuals with higher past week cannabis use and research attitudes were .50 times and .86 times as likely to participate in a follow-up for cash (χ^2=24.44, df=6, p<.001). Overall, males and higher sensation seekers were more likely to agree to any follow-up study, while those with higher typical weekly cannabis use (beta=-.16, p<.05) and positive research attitudes (beta=-.33, p<.01) were less likely to agree to a follow-up (F(7, 294)=8.11, p<.001). Those who volunteer to ingest cannabis in the lab systematically differ from those who come in to complete a survey, and volunteers for cannabis research are more likely to be male and higher in sensation seeking. These data suggest that those who volunteer to ingest cannabis use are not representative of many cannabis users, impacting the generalizability of results.

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Gender Bias in the Cannabis-Associated Problems Questionnaire (CAPQ): A Replication and Extension

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Research on gender differences in cannabis-related problems not only continues to fascinate researchers but also requires an unbiased assessment of these problems. Otherwise, gender differences might arise because of measurement problems rather than true differences. Previous work suggests that the Cannabis Associated Problems Questionnaire (CAPQ; Stephens, Roffman, & Simpson, 1993) includes items biased by gender based on Differential Item Function (DIF; Lavender et al., 2008). Unfortunately, few DIF analyses of any scale replicate. The present study sought to replicate the findings of Lavender and colleagues (2008) in 4,053 cannabis users (Mage = 32.77, 60% male) by examining gender differences across measures of cannabis use and related consequences. Men endorsed greater monthly cannabis use (t=6.80, p<.001, Cohen's d=.22), greater daily use (t=8.07, p<.001, Cohen's d=.27), and a greater average high (t=5.89, p<.001, Cohen's d=.19) than women. Men also scored higher than women on global CAPQ scores (t = 6.292, p<.001, Cohen's d=.17, Mmale = 27.42, SDmale = 8.64, Mfemale = 25.99, SDfemale = 8.394). At the individual item level, eight items showed uniform differential item functioning (DIF) after using a Bonferroni-corrected p-value to account for inflations in Type I error ($\chi2$ ranged from 14.21 to 63.50, p< .001). Specifically, four items that replicated in the Lavender et al. (2008) study showed gender DIF. Items 1 (problems between you and your partner; t=5.79), 2 (problems in your family; t= 8.18), and 14 (legal problems; t=12.62) appeared biased against males based on elevated mean scores (p < .001). Item 15 (decreased energy; t= -2.48, p<.05) yielded significantly higher scores for females than males. Additionally, four new items emerged as problematic. Items 3 (to neglect your family; t=4.70) and 6 (to lose a job; t=4.95) revealed higher average endorsements for males than females (p<.001). Conversely, items 7 (to have lower productivity; t=-1.87, p=.062) and 8 (medical problems; t=-2.82, p<.01) showed gender bias toward women based on higher mean scores. Removal of these eight items slightly reduced Cronbach's alpha for the scale from .849 to .807; however, gender differences still remained on the condensed version (t=3.77, p <.001, Cohen's d=.12). Finally, correlations between both the full and short-form of the CAPQ and measures of monthly cannabis use (r=.087 and .076, respectively), daily cannabis use (r=.098 and .097), and average high (r =.154 and .120) were slightly diminished but showed a similar pattern of significance. Taken together, these results demonstrate that certain items of the CAPQ may impose biased responses based on respondent

gender. Items biased against men appeared to be related to family and relationship functioning, occupational impairment, and legal issues, while items biased against women involve behavioral and medical dysfunction. Removal of these items yields a drastically shorter scale with similar psychometric properties and identical functioning. While true discrepancies may exist between males and females in their experience of cannabis-related consequences, a condensed form of the CAPQ with biased items removed, may allow for a better understanding of this phenomenon.

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From A (abstain) to Z (zooted): Qualitatively Assessing Marijuana-related Terminology among Late Adolescents and Young Adults in Washington State to Inform Development of Implicit Association Tests

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Implicit Association Tests (IATs) are computerized reaction time measures that aim to assess implicit associations between various constructs. IATs include various stimuli presented as pictures or words on a computer screen to represent the constructs of interest for measurement. As more states continue to legalize the recreational use of marijuana, the culture surrounding marijuana is rapidly changing. In turn this has created a need to validate images and words that represent today's marijuana culture to be included in the development of IATs. The aims of this study were to 1) improve our understanding of terminology currently used to describe marijuana and marijuana-related constructs in a state with legalized recreational use of marijuana, and 2) develop word-based stimuli for a novel IAT that aims to measure associations between marijuana and one's identity. Data come from focus groups for two studies; one with late adolescents (N = 30, ages 15-18) and one with young adults (N = 22, ages 18-25). Participants in both sets of focus groups were asked to provide words commonly used to refer to the following categories: 1) marijuana itself, 2) people who use marijuana regularly, 3) people who abstain from marijuana use, 4) marijuana's effects, and 5) modes of marijuana use and associated paraphernalia. Participants provided written lists of words referring to these categories and engaged in discussion on the use of these words in their day-to-day lives. Stimuli chosen for the development of the IAT include words that were endorsed as being most typically used in conversations among peers including "stoner," "high," and "smoke." Discussion of marijuana-related terminology revealed several important themes including context specificity of stigma regarding certain words (e.g., "stoner"); generational differences in terminology (e.g., "pot" vs. "dank"); and words reflecting modern modes of use that are increasing in popularity (e.g., "dabbing").

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To Bake or Not to Bake? Individual Differences in Adverse Reactions to Cannabis

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Recent trends towards legalization of recreational cannabis in North America have increased access to, and social acceptance of recreational cannabis. These trends may increase experimentation with cannabis among novice users. Acute cannabis use is known to be associated with a variety of common side effects including anxiety, paranoia, apathy, panic attacks, loss of motivation, altered sense of time, euphoria, and reduced stress. Furthermore, it appears that some people are more likely to experience positive drug effects while others appear to be vulnerable to the negative effects of cannabis. However, we presently have little ability to predict who is at higher risk of experiencing negative effects of cannabis and who is more likely to perceive these effects as distressing. This study was designed to assess adverse reactions to cannabis and explore possible predictors of these effects. The Adverse Reactions Scale (ARS) was developed for the present study and comprised 28 adverse reactions to cannabis that were identified by compiling negative effects from previous empirical literature

and consulting with experienced cannabis users. The ARS was administered to over 1000 undergraduate students in an online survey that also contained measures of cannabis consumption patterns (DFAQ-CU), personality (NEO-FFI), anxiety (BAI), depression (BDI), cannabis use motives (MMM), and cannabis use disorder symptoms (CUDIT). Results indicated that negative affect, personality traits, motives for cannabis use, and symptoms of cannabis use disorder predicted both the frequency of, and level of distress caused by, adverse reactions to cannabis. Specifically, anxiety, depression, stress and neuroticism were positively correlated with number of adverse reactions to cannabis. Enhancement, expansion, and conformity motives for cannabis use, and symptoms of cannabis use disorder were also positively correlated with number of adverse reactions experienced. Additionally, conscientiousness was negatively related to number of adverse reactions experienced, and both conscientiousness and conformity motives were positively associated with level of distress associated with adverse reactions. Furthermore, frequent cannabis users, individuals high in openness to experience, and those using cannabis for coping, enhancement, and social motives were less likely to experience distress from adverse reactions to cannabis. Results of this study have implications for cannabis users who may be at increased risk for experiencing distressing negative effects of cannabis use based on personal characteristics, such as affect, personality, or cannabis use motives.

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Over Baked: Adverse Reactions to Cannabis

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Recent trends toward the legalization of cannabis in North America may increase experimentation with the drug among novice users. However, novice users may have limited knowledge of possible adverse reactions to cannabis. Two of the most well-known adverse reactions are anxiety and paranoia, however, few studies have documented the prevalence of other possible adverse reactions. Therefore, the present study was designed to determine the prevalence of various self-reported adverse reactions to cannabis as well as level of distress produced by each. To achieve this goal, a measure of adverse reactions to cannabis (Adverse Reactions Scale [ARS]) was created by consulting previous empirical literature, popular sources, and experienced users. The ARS included a list of 28 reactions to cannabis as well as a free response option. For each, participants indicated whether or not they had ever experienced the reaction as well as the level of distress they experienced. A total of 732 cannabis-using students at Washington State University completed the inventory as part of a larger online survey. Results indicated that the most common adverse reactions reported were: anxiety (55.1% reported experiencing this reaction), paranoia (53.2%), feeling off balance (51.4%), light-headedness (48.6%), dissociation (43%), dizziness (42.3%), feeling of body humming or vibrating (39.5%), and feeling out of control (38.2%). Participants reported experiencing the following reactions as most distressing: panic attack, fainting, vomiting, paranoia, anxiety, heart palpitations, and trouble breathing. Results from the present study provide a more comprehensive account of the various adverse reactions to cannabis that individuals may experience, which may be used to educate novice users about potential unwanted side effects.

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Marijuana-related Perceptions as Mediators of the Association between Trait Impulsivity and Marijuana Outcomes

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Background: Previous research has found that normative perceptions (descriptive norms, injunctive norms, and college-related alcohol beliefs) mediate the association between more

distal antecedents (i.e., personality traits, including impulsivity) and alcohol outcomes. The purpose of this study is to examine these associations for marijuana outcomes through examining the effect of trait impulsivity on marijuana outcomes via descriptive norms, injunctive norms, and college-related marijuana beliefs. In addition, we sought to test the structural invariance of the model across countries and sex. Method: College students from five countries (U.S., Argentina, Uruguay, Spain, and the Netherlands) completed an online survey as part of a broader study focused on mental health, personality traits, and marijuana use behaviors. Only data from students that reported past month (i.e., past 30-day) marijuana use (n=1,175; 62.9% females) were included in the final analysis from each country (U.S., n=698; Argentina, n=153; Spain, n=178; Uruguay, n=79; Netherlands, n=67). A comprehensive saturated mediation path model was conducted such that double-mediated paths were examined for each impulsivity-related trait and perceived norms. We examined the total, indirect and direct effects of each predictor variable on marijuana outcomes using bias-corrected bootstrapped estimates. In order to test whether our mediation model was culturally-specific or culturally-universal, we conducted $\chi2$ difference tests comparing a freely estimated multi-group model to a constrained multi-group model (i.e., constraining the paths of the mediation model) to determine whether constraining the paths to be equivalent across countries and sex resulted in a worse fitting model. Results: The present results indicate that marijuana-related norms mediate impulsivity-marijuana outcomes associations. Additionally, we found unique significant mediations, via particular perceived norms (specifically injunctive norms), involving specific impulsivity-facets and marijuana outcomes. Further, our findings supported the robust role of college marijuana beliefs as a proximal mediator of personality-marijuana outcomes associations and indicate that this role is still significant when examining the multifaceted nature of impulsivity. Finally, this mediational model was found to be invariant across sex and across different countries/cultures. Discussion: Based on results from the path analysis, impulsivity-like traits, and normative perceptions work in concert to result in marijuana use, which in turn portends risk for marijuana-

related consequences. Negative urgency had a robust positive association with marijuana-related consequences, which suggests that intervention and prevention efforts should focus on targeting negative urgency specifically, regardless of cultural background. Of all normative perceptions measured, the strongest and most robust effects were found for perceptions about marijuana use as being part of the college experience. College administrators and other stakeholders could work together with clinicians and public health experts to develop social norms campaigns targeting this perception. Changing the perception that marijuana use is central to the college experience may be an efficient way to reduce marijuana use and related consequences on a large scale.

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Chronic Marijuana Use, Inhibitory Control, and Processing Speed in Young Adult College Students

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Objective. Marijuana is the most widely used illicit substance in the United States, and its use is especially prevalent among young adults. Over the past two decades, there has been an overall decline in perceived harmfulness of marijuana use in young adults ages 18-30, despite growing evidence that chronic marijuana use may be associated with cognitive impairment. There have been mixed results regarding the effects of chronic marijuana use on inhibitory control. Furthermore, previous literature has shown inconsistent results regarding processing speed in marijuana users. The current study examined inhibitory control and processing speed in chronic marijuana-using young adult college students and healthy controls ages 18-22. Methods. 33 healthy controls (mean age: 19.18 ± 1.13; 18 male) and 28 chronic marijuana users (mean age: 20.25 ± 1.17; 19 male) were included in the study. Chronic marijuana users had to have used marijuana ≥5 times/week over the past year to be eligible. Participants were instructed to remain abstinent from marijuana use for 12 hours prior to the study visit. The 30-day Timeline Followback (TLFB)

was used to assess recent marijuana use and participants were asked to estimate age at first marijuana use and lifetime days of marijuana use. Participants completed the Stroop Color Word Task (SCWT), and the interference t-score was used as a measure of inhibitory control. Furthermore, we examined marijuana use characteristics (i.e. age at first use, lifetime marijuana use, and past 30-day marijuana use) in relation to performance on the SCWT. Additionally, exploratory analyses investigated differences in the color and word conditions of the SCWT between the two groups and as a function of marijuana use characteristics. Results. Results indicated no significant group differences on the interference, word, and color conditions of the SCWT. Furthermore, there were no significant correlations between age at first use, lifetime marijuana use, and past 30-day marijuana use with any conditions of the SCWT, but, there was a trend for greater past 30-day marijuana use to be associated with poorer performance on the color condition $(r(26) = -0.26, p = 0.09)$. Conclusion. These findings indicate that chronic, heavy marijuana use may not be associated with impairments in inhibitory control or processing speed, which is consistent with other studies examining current use, heavy use, and chronic use in adolescents, young adults, and adults. Further research is needed to determine whether chronic, heavy marijuana use during young adulthood affects higher-order cognitive functioning skills needed for success in college, starting a career, and transitioning into adulthood.

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Facets of Impulsivity are Differentially Associated with Marijuana Use Through Expectancy Effects: An Expanded Test of the Acquired Preparedness Model

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The acquired preparedness model (APM) posits that the relationship between impulsivity and substance use is mediated by drug effect expectancies. Specific to marijuana, college students high in impulsivity hold weaker negative marijuana-related expectancies and subsequently use marijuana more often. However, research applying the APM to marijuana use has yet to examine how these relations may vary by specific facets of impulsivity, as there are differential associations between various impulsivity traits and certain aspects of substance use. Therefore, the current study aimed to expand the APM as an explanatory model for marijuana use by examining the mediated effects of positive and negative expectancies on the relation between different facets of impulsivity and marijuana use. College students (N = 480, Mage = 19.42, 63.2% female) completed an online survey assessing frequency of past-month marijuana use, five facets of impulsivity via the UPPS-P, and expectancies via the Marijuana Effect Expectancy Questionnaire. A bootstrapped path analysis was conducted, in which the UPPS-P subscales were modeled as predictors of past-month marijuana use via positive and negative expectancies. Marijuana use was modeled using a zero-inflated Poisson distribution, wherein presence of past-month marijuana use was examined independently of frequency of use. There was a significant indirect effect of sensation seeking on frequency of use through positive expectancies, such that higher sensation seeking was associated with stronger positive expectancies, which was associated with increased frequency of past-month use ($Î² = 0.10$, 95% CI [0.02, 0.18]). There were two significant indirect effects of facets of impulsivity on presence of use through expectancies. Higher negative urgency was associated with decreased likelihood of use through stronger negative expectancies ($Î² = -0.87$, 95% CI [-1.08, -0.29]), and higher lack of premeditation was associated with increased likelihood of use through weaker negative expectancies ($Î² = 0.50$, 95% CI [0.23, 0.84]). There were no significant indirect effects for positive urgency or lack of perseverance. These results expand previous literature on the APM and marijuana use by underscoring the importance of examining impulsivity as a multi-dimensional construct when trying to understand marijuana use. These findings are consistent with prior results if impulsivity is equated with lack of premeditation; however, they provide a more nuanced understanding of how other impulsivity

traits relate to marijuana use. Importantly, thrill-seeking is related to frequency of marijuana use through positive expectancies, and individuals high in negative urgency may actually be less likely to use marijuana through strengthened negative expectancies. Knowledge that facets of impulsivity differentially relate to expectancies and marijuana use can better direct targeted and efficacious prevention or intervention efforts to reduce marijuana use.

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Measuring the Gap: Predictions from Dual-systems Theory

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The dual-systems model of behavior posits that spikes in deviant behavior in late adolescent and early adulthood arise from the differential development of two neurobiological systems: the cognitive control systems and socioemotional system. The cognitive control system directs executive functioning and impulse control. The socioemotional system processes emotions, social cues, and reward. There is evidence that the cognitive control system develops linearly and does not fully mature until adulthood. The socioemotional system develops curvilinearly, peaking in adolescence. This rapid development and early peak in the socioemotional system during adolescence, along with the linear development of cognitive control results in a developmental "gap" between the two systems. The gap produces an impulsive need for novel and exciting experiences with little ability to control those impulses. This results in a propensity to engage in deviant behavior. The current study utilized a novel approach to modeling the gap between the two elements of dual systems theory to test relations between the gap and deviant behavior. The divergence between the two systems was assessed in a sample of college undergraduates (N = 7,109) and associations with cannabis use were tested. The UPPS-P Impulsive Behavior Scale (UPPS-P) was used to operationalize the cognitive control system and the Sensation Seeking Personality Type

Questionnaire (SSPT) was used to operationalize the socioemotional system. Two Dual-system Latent Risk Scores (DLRS) were created from the subscale scores of these measures. The Experience Seeking/ Cognitive Control DLRS represents the extent to which an individual's desire for novel experiences outweighed their ability to exert control over their behavior. The risk Seeking/ Cognitive Control DLRS represents the extent to which an individual's desire for risky experiences outweighed their ability to exert control over their behavior. The Experience Seeking/ Cognitive Control DSLR was significantly positively related to 30-day cannabis use (b = 0.29, se = 0.03, p < .001). The incident rate ratio (IRR) for the effect of the Experience Seeking/ Cognitive Control DSLR (e0.29 = 1.34) indicates that a one unit increase in the DSLR results in a 34% increase in expected number of times during the last 30 days that cannabis was used. The Risk Seeking/ Cognitive Control DSLR was also significantly positively related to 30-day cannabis use (b = 0.15, se = 0.03, p < .001). The IRR (e0.15 = 1.16) indicates that a one unit increase in the DSLR results in a 16% increase in expected number of times during the last 30 days that cannabis was used. These findings support the proposition of the dual systems model that deviant behavior arises from the divergence of the two component systems. Clinicians can utilize these findings to inform efforts aimed at reducing cannabis use in adolescents and young adults. Either increasing the influence of the cognitive control system or reducing the influence of the socioemotional system may serve to reduce cannabis use. Numerous interventions already exist to foster emotion regulation. Results of the current study suggest that these interventions may be effective in reducing cannabis use.

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Effects of Menstrual Cycle Phase on Impulsivity and Cannabis Use in Female Cannabis Users

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Menstrual cycle phase has been shown to impact inhibitory control, a mechanism underlying

impulsive behavior. Specifically, women exhibit less efficient inhibitory control in the follicular phase compared to the menstrual and luteal phases. Substance use has also been linked to deficits in inhibitory control. Past findings have shown increased craving and self-administration of various substances in the follicular phase, but little research has been done on the effects of menstrual cycle phase on impulsivity in cannabis users. The present study examines the relationship between menstrual cycle phase, impulsivity and cannabis use in 67 young adult women using a behavioral paradigm and three ecological momentary assessment (EMA) self-report measures. Participants were recruited as part of a larger longitudinal study on recreational cannabis use. The Menstrual Cycle Questionnaire was used to determine menstrual cycle phase at the time of the assessment. Participants also completed the Stop Signal Task, which is a widely used assessment of response inhibition. They then completed three EMA measures: the Barret Impulsivity Scale-Brief (BIS-Brief), a self-report measure of impulsivity, as well as two self-reported assessments of cannabis use: cannabis craving and total days of cannabis use during one week of EMA. Due to the skewness of the data, we used non-parametric statistical tests to examine our hypotheses. A Mann-Whitney test indicated that women in the menstrual and follicular phases exhibited more difficulty inhibiting responses on the Stop Signal Task than women in the luteal phase (U = 326.000, p= 0.004). A Kruskal-Wallis H test showed no significant differences by phase in the EMA measures: BIS-Brief ($\chi2(2)$ =2.818, p= .244), craving ($\chi2$ (2) = 1.135, p = .567), and days of cannabis use ($\chi2$ (2)= 1.733, p =. 420). Higher medians were found in the follicular phase compared to the menstrual and luteal phases for all measures: BIS (menstrual median = 26.813, follicular median = 34.875, luteal median = 30.750); Craving (menstrual median = 3.500, follicular median = 15.000, luteal median = 9.500); days of cannabis use (menstrual median = 1.000, follicular median = 4.000, luteal median = 2.500). As has been demonstrated in past research on substance use and menstrual cycle phase, participants in the follicular phase exhibited higher impulsivity than participants in the luteal phase. Increased difficulty inhibiting responses during the follicular phase could be a predictor of increased cannabis use. Analyses of cannabis craving, frequency of cannabis use, and menstrual phase did not reach significance in this study. This result could be due to being underpowered for the effect, as descriptive statistics indicated increased craving and increased cannabis use in the follicular phase compared to the menstrual and luteal phases. These results demonstrate the need for further research on the role that impulsivity plays in the effect of menstrual cycle on cannabis use.

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Harassment and Marijuana Use among Adolescents in Oregon Counties with Retail Availability of Marijuana

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Objective: Research has suggested lower marijuana use by adolescent bullying victims due to difficult accessibility of marijuana mainly because of their limited association with peer groups. However, bullying and harassment has been associated with negative mental health outcomes, and the use of marijuana and other substance use to self-medicate for mental health issues and to cope with harassment. This study investigates whether easier accessibility of marijuana through legalization of recreational marijuana sales in Oregon counties is associated with higher marijuana use for students who report harassment. Method: Data for 6th (n = 12,175), 8th (n = 12,937) and 11th graders (n = 8,516) from the 2018 Student Wellness Survey in 35 Oregon counties (N = 33,628) were analyzed using multi-level logistic regression models in HLM software to assess past 30-day marijuana use among students who did and did not experience past 30-day harassment in counties that have allowed recreational marijuana sales since 2015 compared to counties that do not. Results: Multi-level logistic regression models indicated that students who live in counties that allow recreational marijuana sales reported more past 30-day marijuana use (OR = 1.26, p < .03; CI 95%: 1.03, 1.54) compared to students that live in counties where the sales are not allowed. A

greater likelihood of marijuana use was observed for students who reported harassment including discriminatory harassment over the past 30-days (OR = 2.01, p < .001; CI 95%: 1.84, 2.20), compared to students who did not report harassment. Discussion: As expected, students reported more past 30-day marijuana use in counties that allow recreational marijuana sales. Although previous research has suggested lower levels of marijuana use for youth that report harassment, our results indicate that students who reported harassment were more likely to report past-30-day marijuana use than students who had not experienced harassment.

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Anti-marijuana Motives: What Do They Tell Us?

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Marijuana motives are typically considered in the context of why people choose to engage in marijuana use; as conceptualized by measures such as the marijuana motives measure (Simons, Correia, Carey, & Borsari, 1998). However, the opposite question is often overlooked, "why do people decline to use marijuana?" The present analysis utilized secondary data from 262 participants who provided their reasons for not using marijuana (reasons given = 1090). These participants responded negative to "In your lifetime, have you ever used marijuana (cannabis, pot, hash, hashish)?" These participants were then asked to freely respond to the question: "Please list briefly, in rank order, the top five reasons for why you do not use marijuana." Five raters assessed each response on an axis of 12 categories that the researcher believed would cover the breadth of the reasons provided by participants. The present analysis utilized Krippendorf's alpha (α; Hayes & Krippendorf, 2017) as a measure of interrater reliability. Examining overall reliability of the raters (α̂ = .53), we found that reliability was significantly improved by excluding the fifth rater (α = .69, Δα = -.17, t = -50.48, p < .001) while excluding any of the other four raters worsened reliability significantly. Following the example of Hayes & Krippendorf (2017), we found that among the

remaining four raters there was modest or better reliability for legal (α = .87), availability (α = .87), social (α = .83), monetary (α = .88), smell (α = .90), interest (α = .75), and academics (α = .80) reasons. We found that 30.91% of participants reported legal reasons, 5.72% availability reasons, 39.69% social reasons, 16.79% monetary reasons, 21.37% smell reasons, 35.88% interest reasons, and 8.40% academic reasons. Thus, in the final analysis we examined the relationship of these seven variables with cannabis refusal self-efficacy and demographic factors.

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Personality, Psychological Well-Being, Negative Affect, and Marijuana Consequences: A Moderated-Mediation Model

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Marijuana consequences (MACQ) are negatively associated with psychological well-being (PWB). Previous research has shown PWB and MACQ are both related to personality. Several facets of personality (i.e., emotional regulation, openness, conscientiousness, extraversion, and agreeableness) have been shown to positively correlate with PWB, with extraversion, openness, and emotional regulation having comparatively stronger associations. Furthermore, low levels of agreeableness, conscientiousness, and emotional regulation relate to higher endorsement of MACQs. Negative affect, related to both anxiety and depression symptoms, has also been shown to relate to greater endorsement of MACQs. Moreover, general negative affect is negatively related to PWB. Individuals low in emotional regulation have shown predisposition to anxiety disorders and co-morbid anxiety and depression. Whether an individual endorses anxiety and depression or not then may have an influence on one's personality, PWB, and endorsement of MACQs. Thus, while examining the relationship between MACQ, personality, and PWB, it may be beneficial to consider the possible moderating effects of anxiety and depression. The current

study aims to examine the relationship between emotional regulation, PWB, and MACQ, in relation to anxiety and depression. Specifically, we hypothesized higher emotional regulation would predict lower MACQ through decreased PWB, and that anxiety and depression would moderate these relationships. Path analysis was used to assess these hypotheses using moderated-mediation models, with separate models for each of the six facets of PWB (autonomy, self-acceptance, purpose in life, environmental mastery, positive relationships, and personal growth). Analyses indicated lower emotional regulation significantly predicted lower levels of autonomy and environmental mastery. The indirect effect of MACQ on these relationships were significant, with higher levels of MACQ also indicating lower levels of autonomy and environmental mastery. Depression was a significant moderator only on the relationship between trait neuroticism and environmental mastery, among individuals who indicated lower levels of depression. Anxiety was not found to be a significant moderator. Findings suggest emotional regulation and well-being may play an important role in lowering the degree to which individuals experience consequences from marijuana use. Further research is needed to assess the relationship of other personality characteristics and MACQ, in relation to well-being and negative affect, to develop a more comprehensive understanding of personality's role in experiencing marijuana-related consequences.

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Do Attitudes About and Injunctive Norms for Alcohol and Marijuana Predict Simultaneous Use?

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Background: Simultaneous alcohol and marijuana (SAM) use (i.e., using alcohol and marijuana together so that their effects overlap) is prevalent among college students and can result in more negative consequences than using either substance alone. It is well established that positive attitudes towards and injunctive norms regarding alcohol and marijuana use predict higher levels of use of each substance. Nonetheless, we do not know how these attitudes and norms affect SAM use. This study examined whether and how attitudes and close friend injunctive norms regarding daily alcohol and marijuana use were associated with SAM use frequency in a sample of college students attending three state universities in states with different legal regulations regarding recreational marijuana use (one state where it was illegal, one where it was decriminalized, and one where it was legal for adults). We also examined whether sex moderated these associations. Methods: Data came from 1,390 students who were past-year alcohol and marijuana users. Students completed online surveys in the fall of 2017 (Wave 1) and 3 months later in the winter of 2018 (Wave 2). Negative binomial regression analyses were performed to evaluate whether one's own attitudes toward, as well as perceived injunctive norms for close friends regarding daily alcohol and marijuana use at Wave 1 predicted SAM use frequency at Wave 2. Sex was evaluated as a moderator in the models and analyses controlled for school. Results: In the first model evaluating the role of attitudes toward daily alcohol and marijuana use, there were significant main effects for sex, own approval for daily marijuana use and own approval for daily alcohol use predicting SAM use frequency at Wave 2. Men engaged in SAM use more frequently than women at Wave 2. Moreover, higher approval for daily marijuana and daily alcohol use at Wave 1 was associated with greater SAM use frequency at Wave 2. There was a significant interaction between sex and self-approval of daily marijuana use, suggesting that the relationship between one's own approval for daily marijuana use and SAM use frequency was stronger for women than men. A second model was run to evaluate whether perceived injunctive norms regarding daily alcohol and marijuana use for close friends assessed at Wave 1 predicted SAM use frequency at Wave 2. There were significant main effects for sex and perceived close friend approval for daily marijuana use, revealing that the more students perceived their close friends approved of daily marijuana use at Wave 1, the greater the frequency of their Wave 2 SAM

use. However, there were no significant interactions between sex and perceived friend approval for daily alcohol or daily marijuana use in predicting SAM use frequency at Wave 2. Conclusions: Positive attitudes and injunctive norms regarding daily alcohol, and especially marijuana use, are associated with higher frequency of SAM use. Moreover, the relationship between attitudes toward daily marijuana use and later SAM use frequency was stronger for women than men in our sample. Therefore, interventions that target attitudes and norms for alcohol and marijuana use can help reduce SAM use among college students and may have particular relevance for women.

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Cannabis Expectancies and Future Time Perspective

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Purpose: Cannabis is being used more frequently throughout the country, and with recent legalization in several states, this trend is likely to continue. Understanding factors that impact initiation and maintenance of use is vital to preventing misuse and abuse of cannabis. Cannabis expectancies predict cannabis use, but many questions remain regarding use patterns and expectancies. Future time orientation has been found to have a negative relationship with substance use, and to impact the relationship between cognitions and cannabis use suggesting a potential moderation effect. The present study examined future time orientation, particularly the degree to which one thinks or plans ahead, and how it may interact with the relationship between expectancies and use. Method/Data: Students at a small liberal arts college in the Northeast (n=109) completed an anonymous online survey that assessed cannabis expectancies, future time perspective, and cannabis use. Regression analyses were conducted to assess variance, and moderation analyses were conducted to assess future time perspective's role, based on previous research. Results: Regression analyses indicated that

cannabis expectancies accounted for a significant amount of variance in amount of cannabis smoked per occasion ($r^2 = 0.13$, $p < 0.01$), past 30-day use ($r^2 = 0.25$, $p < 0.01$), lifetime use ($r^2 = 0.10$, $p < 0.01$), past week quantity smoked ($r^2 = 0.05$, $p = 0.04$), and past week frequency of use ($r^2 = 0.18$, $p < 0.01$). Future time perspective did not significantly moderate any of these relationships, but there was a near significant interaction effect on amount smoked per occasion that was examined at high and low levels (+1 and -1 standard deviation) of future time perspective. Simple slopes were graphed to better understand this potential relationship. Conclusion: Results suggest that future time perspective may moderate the relationship between cannabis expectancies and cannabis use. Additionally, cannabis expectancies accounted for a significant amount of variance in several cannabis use measures, indicating that expectancies may play a role in use patterns. A large body of literature suggests that alcohol expectancies may be causal in determining alcohol use, and the same may be true for cannabis expectancies. There were limitations that may have impacted the results of this study. First, the sample may have been too small to detect hypothesized effects, and future studies should take this into account. Second, data was collected from a single university limiting generalizability.

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Marijuana Use and Perceived Descriptive Norms among 2-year and 4-year College Students

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Significance: Young adults (YAs) are at increased risk for marijuana (MJ) use and related harms. While nearly 40% of college students in the U.S. attend 2-year colleges, over half of whom are YAs, we know very little about MJ use and risk factors for use among 2-year students relative to traditional 4-year students. An important risk factor appears to be the extent YAs overestimate peers' substance use and correcting these misperceptions has been an effective strategy for

reducing substance use among 4-year students. The present study examines patterns of MJ use and perceived norms among 2- and 4-year students with an eye toward understanding how norms function among 2-year students to inform potential interventions aimed at decreasing high-risk use. Methods: Participants included 506 YAs aged 18-24 (M=20.17, SD=1.58) participating in a longitudinal study examining substance use and social roles. Participants reported educational status [2-year (n=167) or 4-year (n=339)], MJ use in a typical week and MJ-related consequences, both in the past month, and perceived peer MJ use. Independent sample t-tests were conducted to assess mean differences between norms and use, separately by college status. Controlling for gender and age, negative binomial regression models were conducted examining if use and perceived norms differed for 2- and 4-year students and also to examine associations between MJ norms and actual use controlling for college status. Tests of differences were conducted to examine if relationship between MJ norms and use differed for 2- and 4-year students. Results: Significant differences between norms and use were detected for 2- and 4-year students (all ps<0.05). Overall, 2-year students reported greater MJ use than 4-year students including, more hours high per week (2-year: M=7.65, SD=14.98; 4-year: M=3.41, SD=8.43), days high per week (2-year: M=1.78, SD=13.39; 4-year: M=1.03, SD=1.93), and hours high per day (2-year: M=1.09, SD=2.14; 4-year: M=0.49, SD=1.20). Two year students reported more MJ-related consequences than 4-year students (2-year: M=6.41, SD=11.02; 4-year: M=4.88, SD=8.72). Two-year students thought that their peers were high more hours per week (M=13.51, SD=13.39), used marijuana more days per week (M=1.78, SD=2.69), and were high more hours per day (M=1.93, SD=1.91) than 4-year students (M=8.59, SD=7.66; M=1.03 SD=2.12; M=1.23 SD=1.09, respectively). In models including educational status and MJ norms, both remained significant and positive suggesting that 2-year status and higher perceived norms are each uniquely associated with increased MJ use (all ps<0.05). No differences in associations between use and norms by college status were observed. Discussion: Results suggest that relative to 4-year students, 2-year students are at higher-risk for MJ use and have higher perceived norms about their peer use. Both 2 and 4-year students thought that their peers used more MJ than their peers actually used. There were no differences in associations between norms and use by college status suggesting that interventions aimed at correcting misperceived peer norms may be an effective strategy for decreasing use among 2-year students. Future research could examine if adapting norms-based interventions to the 2-year college context is effective at reducing MJ use and related consequences.

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Marijuana Use in Adolescence Predicted Alcohol and Drug-related Problems in Young Adulthood

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We examined whether marijuana use in adolescence predicted substance use related problems in young adulthood. Previous research indicated that marijuana use is associated with alcohol and other substance use (Lee et al., 2019; Roche et al., 2019). However, the long-term relations between marijuana use and problems of other substances is less clear. In this study, we examined the prospective relations between marijuana use and a number of substance use outcomes, including alcohol and drug-related problems. Study participants were 6504 adolescents from the National Longitudinal Study of Adolescent Health (ADD HEALTH) (Harris et al., 2009). Data were collected from interviews and questionnaires. The current study analyzed data at Times 2 and 3 (T2 & T3). The two waves of data collection were 5 years apart from one another. Participants were approximately 16 years old at T2 (Mean=16.02, SD=1.62). Marijuana use in the last year was measured by the question, "In the past year, have you used marijuana?" Alcohol-related interpersonal problems were measured by five items, asking whether the respondent had problems with their friends or family due to their drinking, e.g., "Over the past 12 months, have you gotten into trouble with your parents because you had been drinking". Additionally, we also examined other substance use problems such as going to work or school while drunk, driving while drunk, using

cocaine, getting into a sexual situation that one later regretted while on drugs. Data were analyzed by logistic regression. All analyses controlled for demographic variables (i.e., sex, age, school grade, poverty, and chronic health problems) as well as depressive symptoms. These variables are either contemporaneously associated with or longitudinally predict substance use in previous research. We also controlled for the specific substance-related problems at the previous wave. T2 marijuana use significantly predicted T3 alcohol-related interpersonal problems (OR = 1.37, p<.01), going to school or work while drunk (OR = 2.03, p<.001), driving while drunk (OR = 1.88, p<.001), ever using cocaine (OR = 4.09, p<.001) and getting into a sexual situation that one later regretted while on drugs (OR = 2.44, p<.001). Marijuana use in adolescence appears to be a robust risk factor for alcohol- and drug-related problems in adulthood.

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Individualized Assessment and Treatment Program (IATP) for Cannabis Use Disorder: Randomized Controlled Trial With and Without Contingency Management

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This study tested a new approach to the treatment of cannabis use disorder (CUD). CUD is difficult to treat, and eliciting abstinence is particularly difficult. The Individualized Assessment and Treatment Program (IATP) was intended to address this problem by providing a highly individualized approach to the training of coping skills most relevant for each individual. To do this, an experience sampling procedure was employed prior to treatment to record patients' marijuana use behavior and associated thoughts, feelings, coping behaviors and situations. This information was used by therapists to plan treatment that would address the specific strengths and weaknesses of each patient in drug-use situations. The present study tested IATP against a conventional combined motivational enhancement-cognitive-behavioral treatment (MET-CBT), with or without the addition of contingency management (CM) for abstinence.

The patients were 198 men and women randomly assigned to one of four 9-session treatment conditions: MET-CBT; MET-CBT-CM; IATP; or IATP-CM. Patients were assessed out to 14 months. Planned contrasts indicated that the IATP conditions yielded greater levels of abstinence than the MET-CBT conditions. The addition of contingency management did not bolster the performance of IATP, but did do so for MET-CBT. As expected, IATP did lead to greater use of coping skills than the MET-CBT conditions. However, coping skills use was not a significant predictor of outcome when other variables were in the same analyses. Self-efficacy was a robust predictor, and mediator, of outcome. We suggest that the highly individualized IATP may act by enhancing self-efficacy.

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Treating Synthetic Cannabinoid ("Spice") Dependence with Psychotherapy and Cannabinoid Replacement Therapy: A Case Report

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Cannabis use disorders are the mostly commonly reported substance use disorder. Even with best practice psychosocial interventions (e.g., CBT) and treatment of acute withdrawal, relapse rates are around 80%. Accordingly, there is strong interest in the development of treatment approaches that combine psychosocial and pharmacological interventions to treat cannabis dependence. Thus far, cannabinoid replacement therapy has demonstrated potential as an intervention, with one systematic review showing promising effects of dronabinol, nabilone, or nabiximols in reducing cannabis withdrawal symptoms. In addition, evidence suggests that combining psychosocial and pharmacological interventions produces the best outcomes. However, far less is known about synthetic cannabinoid dependence (e.g., Spice®, K2®) and withdrawal. Though synthetic cannabinoids are chemical relatives to substances found in cannabis, they have different chemical structures

and are full agonists at cannabinoid receptors, resulting in often different and more extreme side effects (e.g., anxiety, psychosis) than cannabis. To our knowledge, there is no existing research that has examined the potential benefits of psychosocial and agonist replacement interventions specifically for synthetic cannabinoid dependence. Accordingly, we present the case of a 28-year-old African American male who presents with symptoms of depression, anxiety, agitation, and synthetic cannabinoid ("Spice") dependence secondary to stress associated with a gunshot wound and resulting paraplegia sustained in 2017. He had struggled with adherence to treatment with multiple discharges against medical advice (AMA), inability to optimally attend to caring for his wounds, and lack of participation with necessary rehabilitation therapies (i.e., physical occupational). During a subsequent inpatient hospitalization in 2019, an addiction and psychiatry consult/liaison service at an urban hospital in the Mountain West initiated a combination of psychosocial interventions focused on increasing motivation towards desired action (e.g., sobriety) and adherence to medical recommendations and cannabinoid replacement therapy (i.e., dronabinol 30 mg TID) for withdrawal symptoms. Unfortunately, after stabilization and discharge, the medication was discontinued at a long-term acute care facility, resulting in leaving the facility, relapsing on spice, and attempting suicide. The medication was re-started in the hospital and only two months after first initiating the treatment, the patient endorsed improvements in mood, insight into the adverse effects of his substance use, and ability to tolerate medical treatment, as well as an overall reduction in withdrawal symptoms (e.g., agitation, mood swings). The patient's follow-up plan includes cannabinoid maintenance therapy while in outpatient psychotherapy and eventual taper upon mental health stabilization. This case provides further evidence for the benefits of combining psychosocial interventions with cannabinoid replacement therapy to patients with cannabis dependence, as alleviating withdrawal and reducing cravings may facilitate greater engagement in psychosocial interventions. In addition, we demonstrate a novel finding that this effect may extend to synthetic cannabinoid dependence, a substance use disorder that remains far less understood. Future research, including randomized controlled trials on the treatment of synthetic cannabinoid dependence, is warranted.

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Marijuana Negatively Impacts Other Health Behavior Change

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Introduction: Negative health behaviors rarely occur in isolation and research is moving to the study of interventions addressing multiple health behavior change in order to maximize impact. There is growing evidence that changes in one targeted health behavior increases the likelihood of changing other similar or related behaviors. The change of more than one targeted health behavior may be facilitated by common factors involved in a behavior change process (e.g., motivation to change, self-efficacy, and processes of change or action-steps). However, little is known about how the presence of an untargeted health risk behavior might impact the change of targeted behaviors. This study examined the impact of marijuana use (untargeted behavior) on reducing risk level alcohol consumption (>3 drinks/day and/or >7 drinks/week) and use of effective contraception (targeted behaviors) in women at risk of an alcohol-exposed pregnancy (AEP). Methods: This study used data from CHOICES Plus (N=261), a study to test a preconception intervention to reduce the risk of alcohol- and tobacco-exposed pregnancy in women who were 18-44, drinking at risk levels, sexually active, fertile, and not using effective contraception. The CHOICES Plus intervention consists of two visits with a behavior health specialist trained in the Transtheoretical Model, Motivational Interviewing, and the CHOICES Plus intervention. Women were recruited from 12 primary care clinics in a large Texas public healthcare system and assessed at 3, 6, and 9 months post-intake. Women receiving the CHOICES Plus intervention were more likely than those receiving Brief Advice to reduce risk of

AEP (Absolute Risk Reduction= -0.233 [95% CI= -0.239, -0.226]) at 9 months. Results: 45% of the women at risk of AEP reported marijuana use (untargeted) at intake to the study. Of the women who received the CHOICES Plus intervention (n=105), those who continued to use marijuana at 9 months were less likely to reduce their risk of an AEP (46.7% of the marijuana users versus 73.3% of the non-users were at reduced risk; OR 3.143; p=.007), less likely to reduce risk level drinking (25.9% of the marijuana users versus 50.0% of the non-users; OR 2.867; p=.013), and less likely to use effective contraception (33.3% of the marijuana users versus 60.0% of the non-users, OR 3.000; p=.007) at 9 months. Discussion: Women who continued to use marijuana through the outcome period in CHOICES Plus had overall worse outcomes. The use of marijuana interfered with the effectiveness of the CHOICES Plus intervention to facilitate change in the targeted behaviors. Marijuana users were less likely to reduce risk level drinking, increase effective contraception use, and reduce the risk of AEP. We are currently testing the addition of marijuana as a target behavior and comparing the counselor-delivered intervention to one delivered by a tablet (NIAAA, 1R01AA022924). Conclusion: Behavioral Health interventionists need to be aware of the negative influence that an untargeted risk heath behavior can have on the probability of positive change in targeted health risk behaviors, and studies addressing multiple risk behaviors simultaneously are needed, particularly when marijuana use is prevalent in the study population.

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Adaptation of Marijuana and Alcohol Use among Participants in a Drunk Driving Intervention

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Purpose: In clinical settings, alcohol interventions have been found to have the inadvertent adverse outcome of increasing non-alcohol-related substance use while the intervention was in effect, though this has not been examined in alcohol ignition interlock interventions. However, the role of other substance use among drivers receiving drunk driving interventions is relatively unknown. One objective of the Managing Heavy Drinking (MHD) study is to examine whether the interlock experience non-alcohol substance use. Though, no significant aggregate changes in alcohol consumption have been found while drivers are on alcohol ignition interlock, deviations within stratified groups is evident. In the current endeavor, we examined the differences in each of the three alcohol outcomes on patterns of marijuana consumption among interlock drivers in New York state (preliminary results). Methods: Participant alcohol use was measured using hair ethylglucuronide (hEtG) at time 1 (during interlock installation) and again at time 2 (6-month follow-up while the interlock was installed on their vehicle). Similarly, marijuana consumption was measured at the same time intervals using blood THC concentrations. The current preliminary study examined participants who provided both hair and blood samples for analysis at both time points (N = 74). Due to a skewed distribution, blood THC levels and hEtG alcohol levels were standardized through log-adjustment. Two-way mixed analyses of variance were conducted to examine changes in levels of ethanol in hEtG and THC in blood within participants between time points as well as interaction effects. Results: Among the sample of 74 participants available at the time this application was submitted, drivers who exhibited a decrease in hEtG levels from time 1 to time 2 (n = 26; 35%) showed a mean increase in THC concentrations in their blood (M = 0.24 in T1 to 0.49 in T2; Î" = 0.25) which was significantly greater than that found in the other alcohol consumption conditions (M = 0.05 in T1 to 0.14 in T2; Î" = 0.09). Differences in blood THC concentrations pre-installation between conditions was not significant; however, changes in THC concentrations while the interlock was installed were significant (F = 272.89, p <.001; Î·2 = .791). Conclusions: Comparison of blood THC concentrations and hEtG levels at time 1 and time 2 suggests that though installing the ignition interlock device requires individuals to better manage their alcohol consumption, at least in some cases, it may also inadvertently increase the

appeal of other substance use (i.e., marijuana in the case of this study). The information from the current study is of particular interest as these drivers may present a risk that has been largely overlooked in prior research in this field. These changes in substance use patterns while on IID, may suggest that interlocks impact more than just alcohol use. This finding is consistent with previous research that has examined the role of other substance use in clinical treatment of alcohol-related disorders. Future studies could determine if this change in substance use behaviors is maintained after the device is removed and how changes in other substance use impact lockouts.

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Perceptions of Cannabis in Patients Receiving Treatment for Substance Use Disorder

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Background: As many as 50% of patients with substance use disorders experience chronic pain, and many patients with substance use disorders use alcohol and other drugs to manage pain. In general and patient populations, cannabis has been associated with reductions in pain and improvements in functioning. However, research on this association has been limited, and few studies have examined the pathways in which cannabis improves pain, particularly in patients receiving substance use disorder treatment. Procedures: We conducted in-depth qualitative interviews with 34 patients diagnosed with chronic non-cancer pain who were actively engaged in specialty substance use disorder treatment in a program serving patients in Oregon and Washington states. The interviews elicited descriptions of patients' use of cannabis for pain and the perceived pathway in which this pain relief occurs. The coding team consisted of 4 research personnel. Codes were iteratively developed from the data following the guidelines of qualitative content analysis. Coded data were sorted into categories and concepts using a thematic analysis of all 34 interviews. Each transcript was coded by two members of the team and consensus was reached on codes through open discussion. When consensus was not met between the two primary coders, the code was discussed among the entire team until consensus was achieved. Exemplar quotes of key themes were selected for inclusion. Results: Patients were predominantly male (88%) and White, Non-Hispanic (91%). Most patients were in treatment for alcohol use disorder (68%) or opioid use disorder (18%). Only one patient was attending treatment as a result of cannabis use disorder, though cannabis use was common in this sample. Of those participants who endorsed the benefit of cannabis - THC and/or CBD - on chronic pain, two perceived pathways emerged. In the first, participants described a direct benefit of cannabis on physical pain. Some patients cited a direct link between cannabis use and a decrease in muscle tension and stiffness. Others detailed a reduction in the need for opioids, muscle relaxants and other previously utilized pharmacologic pain relievers. In the second pathway, participants described an indirect benefit of cannabis on chronic pain through improvements in mental health functioning. For these patients, cannabis distracted them from the pain, "took the edge off," or reduced anxiety and depression, which subsequently resulted in less pain. Conclusion: Many patients receiving treatment for active non-cannabis substance use disorders in this sample experienced reductions in pain and improvements in functioning with the use of cannabis, though benefits sometimes occurred indirectly through improvements in mental health. Given widespread legalization of cannabis in the U.S. for medical and recreational purposes and the growing interest among patients to use cannabis as a primary or secondary pain treatment modality, additional well-controlled studies are needed that examine the benefits and harms of cannabis for chronic pain.

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Childhood Emotional Abuse and Hazardous Use of Cannabis and Alcohol: The Mediating Role of Emotion Dysregulation

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Purpose: Adverse childhood experiences such as emotional abuse have been linked to maladaptive behaviors such as substance use. Emotion dysregulation has been found to mediate the relationship between emotional abuse and hazardous opiate use (Barahmand, Khazaee, & Hashjin, 2016). However, there is limited literature that focuses specifically on the role of emotion dysregulation in connecting childhood emotional abuse with cannabis and alcohol use in young adulthood. We hypothesized that a history of greater childhood emotional abuse predicts more hazardous cannabis and alcohol use in young adulthood. Method: Participants (N = 224; 56% female) who reported alcohol and cannabis use were pulled from a parent study of cannabis users. Participants completed measures on history of childhood trauma (CTQ), emotion dysregulation (DERS), and hazardous cannabis and alcohol use (CUDIT-R; AUDIT). Simple mediation analyses were performed on cannabis and alcohol use separately. Data and results: Emotion dysregulation mediated the relationship between childhood emotional abuse and both hazardous cannabis use ($p < .001$, R-square = .11) and hazardous alcohol use ($p < .001$, R-square = .17), such that childhood emotional abuse predicted emotion dysregulation, which then predicted hazardous cannabis and alcohol use. The direct effect of childhood emotional abuse was non-significant in the cannabis model; however, it was significant and negative in the alcohol model. Conclusion: Emotion dysregulation helps to explain the mechanism by which childhood emotional abuse is associated with hazardous substance use. These findings expand on the previous literature in identifying this association with both cannabis and alcohol use

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Examining the Relationships between Anxiety Sensitivity, Interoceptive Awareness, and Cannabis Use

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Emerging research supports links between anxiety sensitivity, interoceptive awareness, and cannabis use. Anxiety sensitivity refers to catastrophizing the meaning of anxiety-related bodily sensations (e.g., elevated heart rate), while interoceptive awareness refers to the tendency to focus on these bodily sensations. Previous research indicates that individuals with cannabis use disorder (CUD) are more sensitive to aversive interoceptive stimuli than those without CUD. Further, anxiety sensitivity has been linked to problematic cannabis use, frequency of use, as well as to both positive and negative effects of cannabis. Nevertheless, previous research on these links has been rather sparse and findings are somewhat equivocal. Moreover, no known research has examined the possibility that interoceptive awareness mediates the relationship between cannabis use and anxiety sensitivity. That is, no one has tested the notion that heightened interoceptive awareness might underlie the relationships between anxiety sensitivity and various aspects of cannabis use. Therefore, the main objectives of the present study were to examine i) whether anxiety sensitivity and/or interoceptive awareness are significantly associated with cannabis use frequency, CUD symptoms, and adverse reactions to cannabis and ii) whether interoceptive awareness mediates the putative relationships between anxiety sensitivity and cannabis use/misuse. A sample of 853 undergraduate students completed an online survey containing measures of anxiety sensitivity (Anxiety Sensitivity Inventory), interoceptive awareness (Multidimensional Assessment of Interoceptive Awareness), cannabis use patterns (Daily Sessions, Frequency, Age of Onset, and Quantity of Cannabis Use Inventory), CUD (Cannabis Use Disorders Identification Test), and adverse reactions to cannabis (Adverse Reactions Scale). Results revealed significant bivariate correlations between anxiety sensitivity and frequency of adverse reactions to cannabis as well as levels of distress associated with these reactions. Anxiety sensitivity was not related to any other cannabis-related outcomes. In contrast, interoceptive awareness was significantly, positively correlated with anxiety sensitivity, cannabis use frequency, CUD, and frequency of adverse reactions to cannabis (but not level of distress associated with them). The mediation analysis further indicated

that interoceptive awareness does not mediate the relationship between anxiety sensitivity and frequency of experiencing adverse reactions to cannabis. These findings suggest that interoceptive awareness is related to various aspects of cannabis use, while anxiety sensitivity appears to be related more specifically to adverse reactions. Therefore, anxiety sensitivity may increase the likelihood that people notice, report, and feel distressed by the acute effects of cannabis. In contrast, interoceptive awareness may increase the likelihood that people notice these effects without the associated feeling of distress. Notably, these results also suggest that interoceptive awareness does not underlie the relationship between anxiety sensitivity and cannabis use.

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Changes in Anxiety Level Are Associated with Changes in Marijuana-related Problems

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Background: The present study aimed to examine whether changes in anxiety over time impact marijuana use and problems in a sample of college marijuana users enrolled in a brief marijuana intervention trial. Past research has shown that many individuals use marijuana in an attempt to self-medicate anxiety symptoms. However, little to no research has examined whether changes in anxiety level over the course of an intervention directly influence intervention outcomes. Method: Participants were 132 college students from a large public university in the United States who reported cannabis use on 4 or more days in the past month and were enrolled in a brief intervention trial. Participants were randomly assigned to the following conditions: 1) marijuana brief intervention + a Substance Free Activities Session (SFAS), 2) marijuana brief intervention + a relaxation session, or 3) assessment only. Participants completed measures of anxiety level, past month marijuana use, and marijuana-related problems at baseline and at a 6-month follow-up.

Results: Changes in days of marijuana use, number of marijuana-related problems, and anxiety were calculated by subtracting 6-month scores from baseline scores for each variable. Pearson's correlations revealed that changes in anxiety level were associated with changes in the number of marijuana-related problems (r = .43) but not with changes in days of past month marijuana use (r = .04). Additionally, a linear regression model that controlled for baseline number of marijuana problems, gender, ethnicity, and days of past month marijuana use revealed that changes in anxiety level were significantly associated with number of marijuana problems endorsed at 6-month follow-up (p<.01). Discussion: Results of the present study suggest that changes in level of anxiety over the course of time impact the endorsement of marijuana-related problems. More specifically, marijuana users who experienced decreases in anxiety levels from baseline to 6-month follow-up experienced decreases in the number of marijuana problems endorsed (regardless of intervention condition). However, changes in anxiety level over time were not associated with days of past month marijuana use, suggesting that anxiety level may be more closely tied to experiencing marijuana-related problems rather than frequency of use. With the legalization of recreational and medical marijuana on the rise, there is an increased need for research on the differential effectiveness of interventions aimed at reducing marijuana use and related problems. These results indicate that specifically targeting anxiety may be worthwhile in future interventions aimed at reducing marijuana-related problems.

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Examining Trait Mindfulness as a Moderator of the Mediating Relationship between Social Anxiety, Using Cannabis to Cope, and Cannabis-Related Consequences

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The present research examined the relationships among social anxiety, coping motives for cannabis use, trait mindfulness and cannabis-related

consequences. Specifically, previous research has identified a positive relationship between social anxiety and cannabis-related consequences despite non-significant findings for cannabis use measured in terms of frequency. Researchers have identified coping motives as a mediator of the relationship between social anxiety and cannabis-related consequences. Mindfulness-based interventions, such as Mindfulness Based Stress Reduction, have been shown to be effective in treating both social anxiety and reducing cannabis use in those with anxiety. Further, trait mindfulness has been shown to have a negative relationship with both social anxiety and cannabis-related consequences. This study examined the potential moderating effects of the five trait mindfulness facets as measured by the Five Facet Mindfulness Questionnaire on the mediating relationship between social anxiety, coping motives for cannabis use, and cannabis-related consequences. Participants (N = 232) were undergraduate college students from a midsized university in the southeastern United States who completed an online survey, including the Social Interaction Anxiety Scale, the Using Marijuana to Cope with Social Anxiety Scale, the brief version of the Marijuana Consequences Questionnaire, a single item measuring past 90-day cannabis use, and the Five Facet Mindfulness Questionnaire. The moderated mediation model was analyzed using PROCESS, an SPSS macro developed by Hayes (2018). Significance was determined using confidence intervals generated from 10,000 bootstrapped samples using the percentile method. Results indicated the Observe, Describe, and Nonreactivity facets of trait mindfulness showed significant moderated mediation, such that those with higher levels of these facets of trait mindfulness show a reduced relationship in the indirect effect between social anxiety, coping motives for cannabis use, and cannabis-related consequences. These findings may have important implications in the development of interventions that can be used to treat individuals who suffer from both social anxiety and cannabis-related problems.

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Motives Matter: Marijuana Use Motives Moderate the Links between Stress and Negative Affect

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Previous research has revealed relationships between stress, depression, anxiety, and cannabis use but the direction of these effects is still rather unclear. Nevertheless, recent research from our lab indicates that acute cannabis intoxication temporarily relieves stress, anxiety, and depression. However, continued use of cannabis to manage these symptoms may exacerbate symptoms of depression and maintain symptoms of anxiety over time. Regular cannabis users commonly report using cannabis to cope with stress. However, previous research indicates that coping motives are potentially associated with negative outcomes, such as problematic cannabis use and symptoms of cannabis use disorder. In the present study, we sought to further explore the nature of the relationships between stress, motives for cannabis use, anxiety, and depression. A sample of 628 cannabis using college students completed an online survey containing a demographics questionnaire, the Depression, Anxiety, Stress Scale, and the Marijuana Motives Measure which measures coping, enhancement, expansion, social, and conformity motives for cannabis use. The results of correlation analyses revealed significant positive relationships between stress, depression, anxiety, and the various motives for using cannabis. Subsequent moderation analyses using Hay's PROCESS macro for SPSS indicated that, after controlling for anxiety, coping motives moderated the relationship between stress and depression. After controlling for depression, conformity motives were found to moderate the relationship between stress and anxiety. No other motives for cannabis use were significant moderators of these relationships. These results suggest that using cannabis to cope with negative affect and other problems may potentiate the link between stress and depression; while using cannabis to fit in or conform with others may strengthen the link between stress and anxiety. Therefore, while previous research indicates that cannabis

provides temporary relief from symptoms of stress, anxiety, and depression, findings from the present study indicate that using cannabis to cope may exacerbate, rather than ameliorate, the potential effects of stress on depression, while using cannabis for conformity motives may compound the effects of stress on anxiety.

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An Initial Trial of a Facebook Intervention for Depressed Cannabis Users

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Cannabis use disorders (CUD) are associated with four times the risk of developing depression; moreover, depression is one of the most commonly cited conditions for which cannabis is used medicinally. Motivational enhancement therapy (MET) combined with cognitive behavioral therapy (CBT) is the current state-of-the art intervention for CUD; nevertheless, availability of this approach is limited. As such, approaches to facilitate dissemination and implementation of CBT/MET via technology could broaden accessibility of increasingly needed treatment for CUD. We developed and pilot tested an evidence-based, computer-assisted strategy combining MET and CBT with a social media intervention delivered via Facebook targeting cannabis use and depressive symptoms. A nonrandomized, 10-week comparison study assigned 43 adults with major depression and CUD in a primary psychiatric care setting to either a computer-assisted CBT/MET intervention, Self-Help for Alcohol and Drug use and Depression (SHADE) (n=26), or to a social media-enhanced intervention, Connected Cannabis Users' Network for Enhancement of Cognitive Therapy (CONNECT) (n=17). The CONNECT intervention combines SHADE with a social media component to enhance social support and between-session practice of essential therapeutic skills, delivered via Facebook. Cannabis use frequency was assessed using the Timeline Follow Back and depression symptoms were measured using the

PHQ-9. CONNECT participants evidenced greater reductions in cannabis use frequency in the past 30 days from baseline to treatment-end, relative to those in the SHADE condition, t(42)=1.8, p<0.05. Likewise, larger improvements in depressive symptom severity among those in the CONNECT group were observed from baseline to treatment-end, as compared to SHADE participants, t(42)=2.0, p<0.05. These preliminary findings suggest that use of a social media platform with secure privacy settings to deliver therapy skills training may improve outcomes over and above those resulting from computerized CBT/MET, and provide an easily deployable strategy for the treatment of depressed cannabis users.

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Sex differences in the Association between Depressive Symptoms and Marijuana Use and Related Consequences among Nonmedical Prescription Stimulant-using US College Students

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Marijuana is the second most common substance (following alcohol) used by US-attending college students. With recent legalization of personal/non-medical marijuana use for those 21 and older in states spanning the nation, research has found increased prevalence, frequency, and consequences of use as well as decreased perceptions of risk among college students in these states. Depression is both a risk factor for and consequence of marijuana use among college students and rates of depression in this population appear to be on the rise. However, longitudinal studies regarding marijuana use and depression report mixed results and tend to focus on the transition between adolescence and young adulthood or have only looked at the impact of marijuana use on later depression. Moreover,

most research has not evaluated whether there are sex differences in the association between depressive symptoms and later marijuana use in college students. The purpose of this study was to examine sex differences in the association between depressive symptoms and subsequent marijuana use and related consequences over time using a longitudinal sample of college students who were screened for past-year nonmedical use of prescription stimulants as a part of a larger web-based intervention study (n=5099). Participants (n=254, 65.0% female) reported past-six-month frequency of marijuana use and related negative consequences and depressive symptoms at baseline and six months later. Multiple linear regression analyses were performed controlling for study condition. Consistent with past research, men used marijuana more frequently than women. Results further revealed that participants who reported more depressive symptoms at baseline used marijuana more frequently six months later. A significant interaction between depressive symptoms and sex indicated that females who reported high depressive symptoms at baseline used marijuana more frequently six months later than females who reported low depressive symptoms at baseline. However, this pattern was not observed for males. Regression analyses further revealed another significant main effect of depressive symptoms on marijuana consequences, indicating that participants with higher levels of depressive symptoms at baseline reported more negative consequences related to their marijuana use at follow-up, but no main effect for sex or significant interaction were found. This study builds on existing research showing a link between depressive symptoms and marijuana use. In particular, female college students struggling with depressive symptoms may be a group who are more prone to using marijuana to cope with their symptoms. In addition, students exhibiting symptoms of depression may be at increased risk for experiencing negative consequences related to their use. Future studies should explore sex differences in the associations between cannabis use disorder/addiction and depression in college students and possible circular directionality of the relationship between use and depressive symptoms.

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Provider Perspectives on Mothers Using Marijuana During Pregnancy and Postpartum

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Background: Marijuana use during pregnancy has significantly amplified in the last two decades. Stillbirth, low birth weight, and admission to neonatal intensive care units are linked to marijuana use during pregnancy. As the potency of Δ-tetrahydrocannabinol (THC) has doubled in the past 10 years in the United States, previous studies may underestimate potential harms from current marijuana use. METHODS: Healthcare providers in a state that legalized the sale of recreational marijuana in 2012 were interviewed to determine their perspectives about perceptions of risks and benefits of marijuana use during pregnancy and postpartum. We used qualitative description methodology to identify common themes in the data (transcripts) to provide definitions and details of the most prominent ideas provided by the participants' responses. RESULTS: Ten healthcare providers gave their perspectives. Five themes emerged from the data: 1) prenatal risk, 2) current trends/normalization after legalization, 3) need for more research, 4) parenting and postpartum risk, and 5) personal beliefs vs. provider approach. CONCLUSIONS: Healthcare providers for pregnant and postpartum women who use marijuana may have a difficult time communicating with their patients about health risks due to perceived lack of definitive research on the topic. All the providers interviewed communicated that they felt that it was not safe for pregnant women to use marijuana, yet many of their patients tell them that they feel it is safe. Many healthcare providers noted an increase in patient disclosure of use after legalization, which may present an opportunity to apply best practices for patient education. Future work will offer healthcare providers a means of effective provision of this information to their patients.

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Depressive Symptoms, Ruminative Thinking, Marijuana Use Motives, and Marijuana Outcomes

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In previous studies, mediation models have shown that depressive symptoms and alcohol outcomes are mediated by rumination and drinking motives. The present study examined whether a similar mediation model could extend into marijuana using a cross-cultural sample. We examined distinct rumination facets (problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts) and marijuana use motives (social, coping, expansion, conformity, enhancement) as double-mediators of the effects of depressive symptoms on marijuana use outcomes and consequences. Using college student marijuana users (n=1,175) from 8 different universities in 5 countries (U.S., Argentina, Uruguay, Spain, Netherlands), we conducted a comprehensive mediation path model. Multi-group models were tested to determine if the proposed mediational model was invariant across sex and different cultures/countries. The present study found that rumination and marijuana use motives mediated the associations of depressive symptoms with marijuana outcomes. Participants who reported having higher depressive symptoms were found to have higher problem-focused thoughts; which in turn were associated with: a) higher endorsement of coping motives which in turn was associated with higher marijuana use and related consequences and b) lower endorsement of enhancement motives which in turn was associated with lower marijuana use and related consequences. The multi-group analyses showed that the model was invariant across sex and the five countries. While the present study found that marijuana use/misuse has a cross-culturally invariant negative affect regulation pathway similar to previous alcohol research, additional research is needed to confirm the role of enhancement motives in the associations of depression, rumination and marijuana outcomes.

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Prevalence and Correlates of Medical Cannabis Patients' Use of Cannabis for Recreational Purposes

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Background. Rates of legal medical cannabis (MC) use are increasing, but little is known about the prevalence and correlates of recreational cannabis (RC) use among medical users (MC/R). Methods. 348 MC users who resided in a state in which MC is legal and had medical authorization to use MC legally completed an anonymous survey in Spring 2017 (64.1% female, 82.8% White, mean age 33.03[±10.37] years). Rates of endorsing MC/R and the following potential correlates of MC/R were examined: the legal status of RC in participants' states of residence, sex, age, race, primary medical condition, MC product(s) used, MC expectancies, features of MC sought out (e.g., high tetrahydrocannabinol [THC] content), and negative cannabis use consequences. Results. 55.5% of MC users engaged in MC/R. MC/R was associated with residing in a state in which RC is legal, being female, using MC for pain or mental health conditions, vaping MC concentrates, holding positive expectancies for combustible MC, and seeking out MC products with high THC concentrations. Preferring MC products with high cannabidiol (CBD) concentrations protected against MC/R. Conclusions. More than half of MC users endorsed MC/R, which is considerably higher than rates of misuse observed for other prescription medications. Findings raise concerns about circumvention of RC laws in states where RC remains illegal and could be used to inform MC regulatory efforts (e.g., reducing THC content, increasing CBD content). Findings also suggest that prevention/intervention efforts to reduce MC/R may be needed, especially among high-risk populations of MC users (e.g., women, patients using MC to treat the symptoms of chronic pain or mental health conditions).

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Examining Marijuana Use as a Risk Factor for Discontinuity of Care among Persons Living with HIV/AIDS

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Background: Marijuana use presents dilemmas for the clinical workforce that treats persons living with HIV/AIDS in the United States, among whom the estimated prevalence of marijuana use is more than triple that of the general population. While use of marijuana may be medically authorized to help manage aspects of the illness (i.e., nausea, neuropathy, pain, weight loss), patient susceptibility to develop marijuana use disorder (MUD) is a concern for many clinicians. Notably, MUD is an established predictor of care discontinuity in the initial years following one's HIV diagnosis and linkage to care, though to what extent such risk extends to all marijuana-using HIV care recipients is unknown. Methods: A comparative examination was undertaken in a multiregional Center for AIDS Research Network of Integrated Clinical Systems (CNICS) cohort of 9153 Americans linked to care at seven affiliated HIV settings. Based on patient reporting on the Alcohol, Smoking, and Substance Involvement Test and its established MUD diagnostic threshold, this CNICS cohort was trifurcated as: 1) marijuana abstainers (n=3376), marijuana users without MUD (n=2932), and those with MUD (n=2845). A binary, HRSA/HAB-defined care continuity outcome (absent, present) was computed from visit data at CNICS-affiliate settings for two years following patients' earliest recorded visit, with affirmative cases as those for whom records in both years documented attendance of two care visits separated by 90+ days. A generalized estimating equation (GEE) tested a population-average model for this binary two-year care continuity outcome. The model: 1) included as potential effect modifiers four established MUD predictors in this cohort (i.e., age-group, sex, care setting, assessment timing), 2) accounted for nonindependence of observations among patients at the seven CNICS-affiliate settings, and 3) specified robust covariance structure due to the large cohort size. Results: The multivariate GEE model revealed a significant marijuana group effect, with lesser rate of care continuity among those with MUD (68%) relative to that among marijuana abstainers (73%) and users without MUD (72%). The GEE model revealed effect modification by patient age-group, with larger discrepancies among young adults (aged 18-29 years) for whom 56% care continuity was evidenced among those with MUD relative to 67-69% among same-age counterparts. In older age-groups, progressively higher care continuity rates were comparable across marijuana groups. The GEE model also revealed effect modification by assessment timing, reflecting differential historical patterns of care continuity by marijuana group. Whereas rates of care continuity among those with MUD were stable across historical periods (66-72%), those rates evidenced somewhat greater historical variability among marijuana abstainers and users without MUD (66-78%). Conclusions: Collective findings distinguish MUD- not marijuana use per se- as a risk factor for discontinuity in the initial years of HIV care, particularly among young adults. These and other at-risk patient groups continue to pose 'marijuana dilemmas' for the HIV workforce, thereby compromising domestic efforts to achieve the '90-90-90' public health goals. To mitigate marijuana-related risks for care discontinuity, HIV care settings may need to expand current surveillance practices to incorporate diagnostic assessment of MUD.

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Attitudes Toward Recreational Versus Medical Marijuana Among Medical Marijuana Users, Recreational Marijuana Users, and Marijuana Naïve Individuals

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Background. Medical marijuana (MM) and recreational marijuana (RM) are the same substance, but perceptions about the harms of use and support for legalization may differ based on the term that is used to describe the marijuana (i.e., MM or RM). Methods. 617 adults completed an anonymous online survey in Fall 2018 (76.8% female, 84.9% white, mean age 45.63[±15.29] years; 28.2% never marijuana users; 26.1% MM only users, 25.4% MM/RM users; 20.3% RM only users). For both MM and RM, participants reported on their perceptions of how high the typical user gets, negative consequences of use, driving impairment, addictive potential, and support for legalization for adults ages 21 and older. Repeated measures general linear models were run to evaluate differences in perceptions based on the marijuana label specified (MM vs RM), marijuana use status, and their interaction. Results. Overall, participants thought that, compared to RM, MM is less likely to induce high, produces fewer negative consequences, impairs driving less, is less addictive, and should be legalized for adults ages 18 and older. For MM, interactions suggested that never users were less likely than MM/RM and RM users to think that MM get users high and more likely than all marijuana users to think that MM use has negative consequences, adversely impacts driving ability, and is addictive. MC only users were less likely than MM/RM and RM only users to believe that MM gets users high and less likely than RM only users to think that MM is addictive. Regarding RM, never users were less likely than all marijuana users to think RM gets users high and to support legalization and were more likely to believe RC use has negative consequences, adversely impacts driving ability, and is addictive. MC only users were more likely than never users but less likely than MM/RM and RM only users to think that RM gets users high. MM only users also were more likely than MM/RM users to think that RM use leads to negative consequences and were less likely than RM only users to support legalized RM. Conclusions. As MM continues to be legalized across the United States, marijuana use and perceptions of acceptability have increased while perceptions of marijuana-related harm have decreased. The current findings suggest shifting public opinion may be driven, in part, by the impact of referring to marijuana as "medical." Among all participants, referring to marijuana as

medical versus recreational reduced all perceptions of harm and increased support for legalization. Where differences in perceptions emerged based on marijuana use status, never users tended to have harsher attitudes toward both MM and RM than did marijuana users. MC only users tended to have more favorable attitudes toward MM and less favorable perceptions of RM. Efforts are needed to educate the public that MM and RM are the same substance and share a profile of positive and negative effects.

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The Benefits of Using Only Medical Cannabis to Treat Chronic Pain Compared to Co-use with Opiate and Non-opiate Pain Medications

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Background: There is limited research on the positive and negative outcomes associated with solely using medical cannabis (MC) to treat the symptoms of pain conditions relative to co-use of MC with opioid and/or non-opioid medications. Methods: An anonymous survey was completed in Spring 2017 by 348 MC users who resided in a state in which MC is legal and had medical authorization to use MC legally. The analytic sample comprised 199 MC patients who reported using MC to treat the symptoms of a pain condition (58.8% female, 87.4% White, mean age 35.3[±10.23] years). Medication use status (i.e., MC only, MC/opioids, MC/non-opioids, MC/opioids/non-opioids) was examined in relation to quality of life, current pain level, the frequency of using combustible MC, MC withdrawal symptoms, and negative consequences of MC use. Results: Patients reported using MC only (61.6%), MC/opioids (17.2%), MC/non-opioids (14.1%), and MC/opioids/non-opioids (7.1%). MC only users reported higher quality of life than the co-use groups with the exception of the small group of MC/opioid/ non-opioid users (n.s.). MC only users reported comparable levels of pain management compared to the co-use groups. No significant differences in the frequency of using combustible MC, the experience of withdrawal symptoms, or the experience of negative consequences of MC

use were observed. Conclusions: Pain patients who endorsed using only MC reported a higher quality of life than MC/opioid and MC/non-opioid users, comparable levels of pain management, and no evidence of increased negative outcomes of MC use (i.e., more frequent use, withdrawal, or negative consequences). These findings suggest that solely using MC to treat pain symptoms may produce comparable or, in some cases, better outcomes relative to co-using MC with traditional pain medications. These findings are particularly promising given the urgent need to reduce opioid pain medication use in light of the current opioid crisis.

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Medical Marijuana's Impact on Patients with Chronic Pain: Looking Beyond an Individual's Level of Function

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Background. Clinical trials examining the efficacy of medical marijuana show limited evidence of its therapeutic potential. The current field of research narrowly focuses on how medical marijuana improves level of functioning and ignores other key aspects of health-related quality of life (i.e. activities of daily living and participation in society). This focus stems from the standard medical approach that views disability as a condition or problem within an individual's body that needs treatment in order to "fix or cure the disability." The purpose of this study was to examine the effectiveness of medical marijuana beyond the level of functioning among individuals living with chronic pain in Florida. Methods. Participants were recruited using convenience sampling from medical marijuana dispensaries, tobacco shops and online through Florida specific Facebook groups. Interviews were conducted using the World Health Organization (WHO) Disability Assessment Schedule (WHODAS 2.0) 12-item version. Semi-structured interview questions were developed using the Social Ecological Model. The WHODAS 2.0 was used to measure the range of disability caused by chronic pain in patients (i.e. level of functioning). The Social Ecological Model was used to highlight the

social determinants surrounding medical marijuana. A direct content analysis was used to analyze interviews. Results. The overall WHODAS 2.0 scores show that most participants had a moderate impairment in functioning. Within the six domains of functioning mobility had greatest level of impairment followed by life activities (i.e. domestic responsibilities, leisure, work and school) and participation (i.e. joining in community activities, participating in society). Five separate themes were analyzed within the data: health impact of medical marijuana, cost, quality of life, social support, and accessibility. Three subthemes emerged from the data that were not initially predicted in the direct content analysis: opioids and addiction, social media and travel. Conclusions. Results of the study show that participants report a significant improvement in functioning, specifically for levels of activity and participation. Overall responses from participants show that medical marijuana may not cure them of their chronic pain, but it relieves symptoms enough for them to live again, thus improving their quality of life. Participants also described using medical marijuana as a replacement for opioids in their treatment of chronic pain. These findings could show the potential for medical marijuana to serve as a harm-reduction approach for opioid addiction.

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Migraines and Cannabis Relief: Online Survey Results from Users in Legal States

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Background: As the legality of and cultural attitudes towards cannabis in the United States become more liberal, an increasing number of Americans are turning to cannabis to self-medicate a number of ailments, including migraines. Both chronic and episodic migraines pose a major public health concern when left untreated by negatively impacting physical health, quality of life, interpersonal relationships, productivity, and financial security. As such, efforts must be made to understand the link

between cannabis consumption and migraine relief. Methods: An anonymous "Cannabis and Health" online survey was advertised in 5 states with legal recreational cannabis to measure cannabis use and health profiles, including migraine prevalence. Individuals (N=606) aged 21 and older living in states with legal recreational cannabis were compared for basic demographic information, cannabis use profiles, migraine prevalence and percent relief from cannabis and non-cannabis treatments. Results: By examining data from an ongoing survey on cannabis use and health, data presented here provide compelling insights into the characteristics of those using legal market cannabis for migraines and the percent of relief that it provides. Like controlled clinical trials and smaller case reports, our results support reports that migraine suffers (N=108 Migraineurs, N=426 Non-migraineurs) were primarily female (3:1 female to male) and aged 35 ± 13 years and reported more edible use compared to non-migraineurs (ps < 0.05). Importantly, cannabis reportedly provided $76\pm0.18\%$ relief for migraines, significantly more than non-cannabis treatments by 30% (p < 0.05). This naturalistic report also demonstrated that non-migraine and migraine sufferers alike report: frequent use of flower and concentrates, cannabis use, with varying strengths of cannabinoids (much higher than previously researched in migraine suffers). Conclusions: These preliminary report in cannabis use and effects on migraineurs lends strong support for further investigation, where blood cannabinoid levels, cognitive effects, and potential cannabis withdrawal could be tested before and after periods of cannabis use in relation to type, duration, and intensity of migraine relief. Understanding how cannabis use may mitigate migraine symptoms is imperative to promoting the health and well-being of migraineurs and is an important first step in determining the potential for cannabis as an effective acute and prophylactic migraine treatment.

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Use of Cannabis for Pain in Patients with Active Substance Use Disorders

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Background: As many as 50% of patients with substance use disorders experience chronic pain, and many patients with substance use disorders use alcohol and other drugs to manage pain. In general and patient populations, cannabis has been associated with reductions in pain and improvements in functioning. However, research on this association has been limited, and few studies have examined the pathways in which cannabis improves pain, particularly in patients receiving substance use disorder treatment. Procedures: We conducted in-depth qualitative interviews with 34 patients diagnosed with chronic non-cancer pain who were actively engaged in specialty substance use disorder treatment in a program serving patients in Oregon and Washington states. The interviews elicited descriptions of patients' use of cannabis for pain and the perceived pathway in which this pain relief occurs. The coding team consisted of 4 research personnel. Codes were iteratively developed from the data following the guidelines of qualitative content analysis. Coded data were sorted into categories and concepts using a thematic analysis of all 34 interviews. Each transcript was coded by two members of the team and consensus was reached on codes through open discussion. When consensus was not met between the two primary coders, the code was discussed among the entire team until consensus was achieved. Exemplar quotes of key themes were selected for inclusion. Results: Patients were predominantly male (88%) and White, Non-Hispanic (91%). Most patients were in treatment for alcohol use disorder (68%) or opioid use disorder (18%). Only one patient was attending treatment as a result of cannabis use disorder, though cannabis use was common in this sample. Of those participants who endorsed the benefit of cannabis - THC and/or CBD - on chronic pain, two perceived pathways emerged. In the first, participants described a direct benefit of cannabis on physical pain. Some patients cited a direct link between cannabis use and a decrease in muscle tension and stiffness. Others detailed a reduction in the need for opioids, muscle relaxants and other previously utilized pharmacologic pain relievers. In the second pathway, participants described an indirect benefit of cannabis on chronic pain through improvements in mental health

functioning. For these patients, cannabis distracted them from the pain, "took the edge off," or reduced anxiety and depression, which subsequently resulted in less pain. Conclusion: Many patients receiving treatment for active non-cannabis substance use disorders in this sample experienced reductions in pain and improvements in functioning with the use of cannabis, though benefits sometimes occurred indirectly through improvements in mental health. Given widespread legalization of cannabis in the U.S. for medical and recreational purposes and the growing interest among patients to use cannabis as a primary or secondary pain treatment modality, additional well-controlled studies are needed that examine the benefits and harms of cannabis for chronic pain.

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Bidirectional Relations between Sleep Problems and Marijuana Use in a Nationally Representative Sample

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Marijuana is a popular substance used among adults with over 48% reporting lifetime use in 2017. Anecdotally and in emerging research, people report using marijuana to help with sleep and certain strains are marketed as sleep aids (e.g., "Tahoe OG Kush"). In the United States more than a third of the adult population report not getting enough sleep, with estimated economic costs of $411 billion annually. Prescription drugs are avoided because they are less effective over time and have unwanted side effects. However, people looking to use marijuana as a sleep aid contradicts research that using marijuana results in more sleep disturbances and reducing marijuana use improves sleep. While some work has looked at how sleep disturbances affect individuals' abilities to reduce their use, there is a dearth of research in this area; particularly how sleep problems and marijuana use may impact each other over time in generalizable samples. The present study addresses current research gaps by investigating the bidirectional relations between sleep problems and marijuana use in a longitudinal nationally representative sample of

adults from the 2013-16 Population Assessment of Tobacco and Health (PATH) Study. Baseline data was collected from 32,320 adults (18 and older) via in-person computerized interviews who were followed annually for two years. Sleep problems were assessed by self-reporting the, "last time you had significant problems with sleep trouble - such as bad dreams, sleeping restlessly or falling asleep during the day." Marijuana use was assessed by self-reporting the last time the participant, "used marijuana, hash, THC, grass, pot or weed." All responses were recoded to: 0 = Never, 1 = More than 1 year ago, 2 = In the past 2-12 months, and 3 = In the past 30 days. A path model focusing on within-person relations using maximum likelihood estimation for missing data was analyzed in MPlus Version 8 accounting for complex sampling and using replicate weights. Results indicated that the data fit the model well (SRMR = 0.003). After accounting for the correlations between the variables at each wave (e.g., Wave 1 sleep problems with Wave 1 marijuana use) and previous levels of each predictor (e.g., Wave 1 sleep problems predicting Wave 2 and Wave 3 sleep problems), more recent sleep problems were significant predictors of more recent marijuana use over time. The reverse was also supported; more recent marijuana use predicted higher rates of sleep problems across all waves (betas = 0.01-0.06; all ps < .000). This study supports a bidirectional relationship between sleep problems and marijuana use, such that individuals who have more sleep problems report more marijuana use and those that use more marijuana, in turn, report more sleep problems. Alternative evidence-based methods for improving sleep, such as cognitive-behavioral therapy for insomnia (CBT-I), may be more appropriate for reducing sleep problems and may result in reduced marijuana use over time. Future work needs to investigate the use objective measures of sleep problems and get more detailed information about the strains and method of marijuana ingestion being used.

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Heavy Marijuana Use and Risky Decision-making in Young Adult College Students

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Objective: Marijuana (MJ) is the most widely used illicit substance, and its use is especially prevalent among adolescents and young adults. Previous evidence suggests frequent MJ use is associated with impairments in cognitive flexibility and inhibition, both of which play important roles in decision-making. However, the effects of chronic MJ use on decision-making performance are mixed and not well understood. Given the protracted development of the prefrontal cortex, young adulthood may be especially sensitive to the neurotoxic effects of MJ use. The current study examined the influence of heavy MJ use on risky decision-making in college students, 18-22 years old, who were recruited as part of a larger study on MJ use and executive functioning. Method: 33 healthy controls (HC) (mean age: 19.18 ± 1.13; 18 male, 15 female) and 27 heavy MJ users (MJ+) (mean age: 20.22 ± 1.19; 18 male, 9 female) reporting ≥5 episodes of MJ use per week over the past year were included in the current study. Participants were instructed to remain abstinent from MJ use for 12 hours prior to their study visit to ensure they were not acutely intoxicated during testing. The 30-day Timeline Followback (TLFB) was used to assess recent MJ use and participants were asked to estimate age at first MJ use and lifetime days of MJ use. Participants completed the Iowa Gambling Task (IGT), a measure of risky decision-making, and net IGT scores (advantageous-disadvantageous decisions) were used as a measure of optimal decision-making. Analysis of covariance was used to examine group differences in decision-making performance while controlling for age and IQ. Furthermore, exploratory analyses investigated the effects of group, sex, and their interaction on decision-making performance. Results: There was a trend for the effect of group on net IGT scores ($F(1,56) = 3.209$, $p = 0.079$, partial eta squared = 0.054), such that MJ+ made more disadvantageous decisions on the IGT compared with HC. The exploratory analyses indicated a non-significant group-by-sex interaction on net IGT scores. The final model with main effects of group and sex showed a significant effect of group on net IGT scores ($F(1,54) = 5.399$, $p = 0.024$, partial eta squared = 0.091) and a trend for the main effect of sex ($F(1,54) = 3.295$, $p = 0.075$, partial eta squared = 0.058). MJ+ had lower net IGT scores than HC and female participants had a trend towards lower net IGT scores than male participants. There were no significant relationships between age at first MJ use, past 30-day MJ use occasions or lifetime days of MJ use and net IGT scores in MJ+. Conclusion: These findings suggest heavy MJ use in young adults may impair adaptive decision-making. Further research is needed to understand whether impairments in MJ+ are a result of the neurotoxic effects of MJ or if riskier decision-making may be present in MJ+ prior to initiation of MJ use, and whether these differences persist after abstinence.

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Cannabis Use Predicts Indicators of Academic Problems Regardless of Academic Self-Efficacy

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College is a heightened time of risk for emerging adults for engagement in a host of health risk behaviors, chief among them the initiation and continuing use of cannabis. A large body of literature indicates that there are risks for negative academic outcomes resulting from cannabis use, including low grades, dropping classes, and eventually dropping out of college all together. However, research often fails to assess attitudes towards school, including whether a college student sees themselves as able to be successful in the college environment. There is also a large body of research that indicates that academic self-efficacy is a significant inverse predictor of negative academic outcomes. Given the prevalence of cannabis use among college students and the costs associated with experiencing negative academic outcomes, it is important to understand whether cannabis use may moderate these relations. We hypothesized that 30-day cannabis use would moderate the relation between academic self-efficacy and indicators of academic problems such that as 30-day use increased the relation between self-efficacy and problems would significantly weaken. Data for this study come from a college undergraduate population attending college at a large public institution in the American West (n =

989, 73.4% female, Mean Age = 19.45, SD = 2.4, 75% White). We SPSS PROCESS V3.3 (Hayes, 2019) was used to test whether past 30-day cannabis use moderated the relation between academic self-efficacy and indicators of academic problems. Results indicated that academic self-efficacy significantly negatively predicted indicators of academic problems (b = -0.12, se = 0.01, p < 0.001). However, results revealed that the relation between academic self-efficacy and indicators of academic problems was not significantly moderated by 30-day cannabis use (p = 0.72). Additional analyses revealed that, while 30-day cannabis use significantly predicted indicators of academic problems (b = 0.35, se = 0.09, p < 0.001), it did not predict nor was it predicted by academic self-efficacy (p = 0.13 and p = 0.13 respectively). That 30-day cannabis use did not impact the negative relation between academic self-efficacy and indicators of academic problems failed to support study hypotheses. This indicates that the relation between academic self-efficacy and indicators of academic problems is robust to cannabis use. However, cannabis use is predictive of increased indicators of academic problems regardless of level of academic self-efficacy. Results indicate that reducing 30-day cannabis use may reduce experiencing negative academic outcomes.

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Cannabis- and Alcohol-Related Protective Behavioral Strategies: Evidence of Crossover Effects

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Over the past few decades, attention to substance-related protective behavioral strategies ([PBS]; i.e., ways in which individuals reduce consumption and/or consequences associated with substance use) has increased exponentially. Most evidence indicates naturalistic use of PBS is negatively associated with consumption and consequences for the respective substance. Moreover, recent work demonstrated PBS crossover effects, such that use of one substance-specific PBS (i.e., alcohol) is associated with reduced consequences for another outcome (i.e., pathological gambling). Original cannabis-related PBS work indicated a small-to-medium association with this construct and use of alcohol-related PBS; however, no study, to our knowledge, has yet to examine potential crossover effects for alcohol- and cannabis-related PBS. Thus, the purpose of this study was to reexamine original PBS association findings and estimate the correlations between use of alcohol PBS on cannabis outcomes (i.e., consumption and use disorder criteria), and vice versa. Participants consisted of college students from a large, Hispanic-serving southwestern institution who endorsed lifetime cannabis use and past-year alcohol use (N = 501). The sample consisted of individuals self-identifying as 65% women, 67% White, non-Latinx, 16% Latinx, mean age = 19.22, SD = 2.41). Participants completed a battery of self-report assessments, including the Protective Behavioral Strategies for Marijuana (PBSM), Protective Behavioral Strategies Scale-20 (PBSS-20), National Institute of Alcoholism and Alcohol Abuse recommended alcohol consumption questions, a modified Daily Drinking Questionnaire to assess past-month cannabis use, and DSM-5 alcohol and cannabis use disorder criteria. First, a series of psychometric evaluations (i.e., exploratory factor analyses [EFA], confirmatory factor analyses [CFA], graded response models, and measurement invariance testing across gender) were conducted. Next, structural equation models were used to examine latent variable correlations among constructs of interest. Results suggested a 44-item, one-factor solution for the PBSM. The PBSS-20 factor solution was not recovered from EFA, though CFA indicated good fit. Measurement invariance was not demonstrated when using multigroup CFA and DIFFTEST. Neither scale exhibited partial scalar invariance, suggesting differential item functioning across at least 8 items per scale. Significant associations suggested crossover effects. Specifically, among women, use of all three types of alcohol-related PBS (i.e., Stopping/Limiting Drinking, Manner of Drinking, and Serious Harm Reduction) was negatively associated with past-month cannabis frequency (rs = -.13 to -.24) and cannabis use disorder criteria endorsement (rs = -.21 to -.37). For cannabis PBS use, a similar pattern emerged

with alcohol consumption (r = -.29) and alcohol use disorder criteria endorsement (r = -.17). Among men, all three types of alcohol-related PBS were associated with cannabis use frequency (r = -.25 to -.43), while only Serious Harm Reduction was significantly associated with cannabis use disorder criteria endorsement (r = -.32). Cannabis PBS use was also significantly associated with alcohol consumption (r = -.29) and alcohol use disorder criteria endorsement (r = -.27) among men. Although these crossover effects require replication in clinical samples, these preliminary findings suggest use of one type of PBS can have protective effects.

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The Effects of Health Beliefs on Marijuana Protective Behavioral Strategies

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Greater use of protective behavioral strategies (PBS) is associated with lower frequency of problematic marijuana use, fewer experiences of negative marijuana related consequences, and fewer symptoms of cannabis use disorder among young adults. Identifying person-specific characteristics related to PBS use is important because of the potential to help explain why some individuals engage in protective behaviors while others do not. The current study employed the health belief model (HBM) as a theoretical base to examine person-level characteristics. The HBM is an effective framework in substance use research for predicting and explaining engagement in preventive behaviors, including self-control strategies for limiting drinking. The goal of the current study was to discern latent profiles of HBM variables (i.e., susceptibility, severity, benefits, barriers, cues to action measured by consequences) and to test whether latent profiles were differentially associated with use of protective behaviors. To achieve this goal, we performed a Latent Profile Analysis (LPA) to identify profiles of health beliefs and marijuana related consequences while controlling for gender and marijuana use frequency. We tested differences in PBS use frequency among the latent profiles using the BCH method in Mplus. The

sample included 334 undergraduate students (Mage = 18.8; 63.2% female; 78.7% White). Following recommendations by Nylund et al. (2007) for determining class structure, a 3-profile solution best fit the data.

We identified three different health belief profiles, labeled as 1) Adaptive Beliefs/Low Consequences (ABLC), 2) Maladaptive Beliefs/Moderate Consequences (MBMC), and 3) Maladaptive Beliefs/High Consequences (MBHC). The ABLC profile was associated with the greatest frequency of PBS use. The MBMC profile and MBHC profiles did not differ on PBS use, but the MBMC profile appears to be associated with more effective use of PBS as a harm reduction method compared to the MBHC profile. Moreover, the MBMC profile was associated with experiencing a moderate amount of consequences despite using PBS, which is likely due to their demotivating belief system. Taken together, these profiles suggest that individuals with adaptive beliefs may be more likely to recognize the severity of consequences and the benefit of protecting oneself through PBS, whereas individuals with maladaptive beliefs appear more likely to minimize the severity and susceptibility of consequences and have greater beliefs of barriers to using PBS. Results of the present study demonstrate the importance of identifying person-specific variables that may facilitate with tailoring brief interventions for marijuana use. For example, individuals in the ABLC profile would benefit from support to continue with their adaptive beliefs and engagement in protective behaviors. Individuals in the MBMC profile would benefit from corrective beliefs to be more adaptive. Lastly, individuals in the MBHC profile would benefit from learning to use more effective protective strategies. Overall, interventions for marijuana use might be more effective by including a focus on beliefs associated with health, as well as helping individuals protect themselves through psychoeducation of PBS.

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Identifying Classes of People Who Endorse Marijuana-related Health Risks and Benefits

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With growing popularity of marijuana, a wide range of perceptions of both the health risks and benefits of its use abound. Currently, many of these perceived effects are based on anecdotal evidence rather than rigorous empirical support. The goal of the current investigation is to explore if meaningful groups of individuals can be identified based on their endorsement of various health effects of marijuana. Undergraduate students (N=398, 77.4% female, Mage=21.21), both users and nonusers, indicated whether they believed 30 health risks (e.g., causes lung damage, worsens sleep quality) and benefits (e.g., relieves pain, protects against memory loss) to be true. A Latent Class Analysis using SAS PROC LCA, considering parsimony and interpretability, revealed a 2-class model best fit the data. Class 1 (C1; 55.1%) reported perceiving few benefits and many risks regarding marijuana use. Class 2 (C2; 44.9%) reported perceiving many benefits and moderate risk. For example, participants in C1 were more likely to endorse that marijuana use could be addictive (87.3%) than those in C2 (43.4%), and less likely to endorse that it could treat nausea and stomachache (55.4% C1 vs. 75.8% C2). Additionally, participants in C2 were more likely than those in C1 to endorse that marijuana use can improve sleep (85.8% C2 vs 70.0% C1) or treat cancer (53.9% C2 vs 40.4% C1), and less likely to endorse some risks such as causing psychosis (23.0% C2 v 67.0% C1). Although individuals in C2 endorsed more benefits to marijuana use, they did not perceive it as risk free. For example, over two-thirds of C2 (67.7%) indicated that marijuana could cause birth defects during pregnancy. There was also agreement between classes (i.e. less than 10% separation in endorsement rates) for 23% of the health risk and benefit items. This agreement included, generally high endorsement of some benefits (e.g. relieves pain; 94.1% C1, 96.6% C2) and generally low endorsement of some benefits (e.g. protects against memory loss; 7.8% C1, 7.2% C2). While there was some agreement across classes, these results may be indicative of the current polarization in attitudes toward marijuana use, with a little over half of individuals perceiving few benefits but many risks in engaging in this behavior, and a little under half endorsing many benefits but only moderate risks. Follow-up analyses will explore if there are differences between these classes in marijuana use and marijuana-related problems. Where these groups differ and agree may yield targets for future marijuana education interventions.

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Protective Behavioral Strategies Mediate the Relation of Happiness, Life Satisfaction, Psychological Well-Being on Marijuana-Related Consequences

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Happiness has been characterized across 17 subjective domains including housing, vocation/education, alcohol/drug use, etc., life satisfaction is defined as a subjective-global assessment of one's quality of life based on standards or expectation the individual has set for themselves, and psychological well-being (PWB) has been characterized across six domains, i.e., autonomy, environmental mastery, personal growth, positive relationships with others, purpose in life, and self-acceptance. There is a great amount of research showing that these constructs are negatively associated with higher levels of marijuana use, but little research has been done to explore the relation between these constructs and marijuana-related consequences (MRC). Additionally, happiness, life satisfaction, and PWB have frequently been explored as outcomes of use and related constructs, but very few studies have examined these constructs as predictors. It has yet to be explored how happiness, life satisfaction, and PWB predict PBS use frequency. The use of protective behavioral strategies (i.e., strategies used to reduce use or harms associated with use) are robustly, negatively associated with MRC. It has yet to be established how differing levels of happiness, life satisfaction, and PWB predict PBS use frequency, and how happiness, life satisfaction, and PWB predict MRC via PBS use frequency. We hypothesized that individuals who report higher levels of happiness, life satisfaction, and PWB would also report using more PBS and therefore would experience less MRC. The present study used data collected from US college students as

part of a large multi-site sample (n = 698, 63.8% female). We used path analysis to examine the mediating power of PBS use frequency on the relations between happiness and MRC, life satisfaction and MRC, and the six individual facets of PWB and MRC, controlling for past 30-day marijuana use. We used the product of coefficients method to determine the significance of the indirect effects. In assessing direct effects, PBS use frequency negatively predicted MRC in all models. Additionally, happiness, life satisfaction, environmental mastery, positive relations with others, purpose in life, and self-acceptance were positively associated with PBS use frequency. The indirect effects from these 6 constructs to MRC via PBS use frequency were also significant and negatively associated. However, autonomy and personal growth did not predict PBS use and the associated indirect effects were not significant. This indicates that happiness, life satisfaction, and some facets of PWB predict MRC through their influence on PBS use frequency. Our findings suggest that the relation between happiness, life satisfaction, and PWB and the experience of MRC may be closely linked to PBS use frequency, and that happiness, life satisfaction, and PWB may be a significant determinate in one's willingness to use PBS. This suggests that happiness, life satisfaction, and PWB may be important factors to take into account when tailoring prevention and intervention efforts. More specifically, focusing these efforts towards individuals experiencing lower levels of happiness, life satisfaction, and PWB could mitigate harms associated with use via PBS.

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Runner's High...or High Runners? Exercise as a Motive for Marijuana Use

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Since 2004, marijuana and cannabinoids have been listed as performance-enhancing drugs (PED; U.S. Anti-Doping Agency, 2019). Nevertheless, many professional and recreational athletes admit to using cannabinoids in training and/or competition with the intent of increasing performance (Huestis et al., 2011; Campian et al., 2018). In the current analysis, we aimed to evaluate the importance of exercise-related motives in predicting the frequency of adult marijuana use, in relation to already established marijuana-use motives. To assess marijuana motives, we used the 5-factor Marijuana Motives Measure (MMM; Simons et al., 1998), a validated measure used in predicting overall marijuana use and use-related problems, which assesses the relative importance of enhancement, conformity, expansion, coping, and social motives for marijuana use. Additionally, we created a 5-item measure of exercise motives assessing participants' beliefs of marijuana's effects on the enjoyment, motivation, recovery, feelings of reward, and performance in relation to exercise on a Likert scale similar to that used in the MMM. Using cross-sectional data collected from marijuana-using adults in Oregon and Washington State, results of a linear regression revealed the 5-factor MMM was not a significant predictor of marijuana use. However, the addition of the exercise motives component resulted in a significant increase of variability explained ($\Delta R2$ = .053, $F(6,70)$ = 2.61, p = .024), such that the overall model with the 6-factor motivation construct significantly predicted marijuana use frequency. The simple effect of exercise motives was a unique and significant predictor (β = .238, p = .037). Given that the MMM has been studied primarily within college students and younger adults, these results provide evidence that a 5-factor model may not accurately capture the complexities of motivations for marijuana use among non-college aged adults. Understanding the role of exercise-related marijuana use motives could help inform future research regarding the physical and mental health implications of using marijuana; for example to facilitate exercise in specific populations such as for individuals with chronic pain disorders or obesity.

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SYMPOSIA

Symposium: Promising (and Not So Promising) Pharmacological Treatments for Cannabis Use Disorder

Chair: Matthew R. Pearson
University of New Mexico

Despite the relatively low addictive potential of cannabis relative to other substances used for their euphoria-inducing properties (e.g., alcohol, tobacco, cocaine, heroin), the high rates of cannabis relative to many of these substances (e.g., cocaine, heroin, etc.) results in cannabis use disorder (CUD) being the third most prevalent substance use disorder (only behind alcohol and tobacco). To date, the U.S. Food and Drug Administration has approved of three medications for treating alcohol use disorder (acamprosate, disulfiram, and naltrexone), three medications for treating opioid use disorder (buprenorphine, methadone, and naltrexone), and six medications for treating tobacco use disorder (buproprion, varenicline, nicotine inhaler, nicotine spray pump, nicotine gum/lozenge, and nicotine transdermal patch). However, no medication is currently FDA-approved for treating cannabis use disorder (CUD). Thus, there is clearly a need to develop effective medications for treating CUD, but there are a number of challenges, including some general challenges to drug discovery in general as well as some specific challenges for treating CUD in particular. Matthew Pearson will present some perspective from systematic reviews and meta-analyses of pharmacotherapies for treating CUD. Kevin Gray will review the evidence base for N-acetylcysteine (NAC) as a treatment for CUD, highlighting differences found with adolescent vs. adult populations. Aimee McRae-Clark will review some new findings with oxytocin, progesterone, and varenicline as possible medications to treat CUD.

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What We Can Learn from Systematic Reviews and Meta-Analyses of Pharmacotherapies for Cannabis Use Disorder

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To date, no pharmacotherapy has been approved for treating cannabis use disorder (CUD). In this systematic review, we characterize the heterogeneity in treatment outcomes as well as the inclusion/exclusion criteria across clinical trials examining pharmacotherapies for cannabis use disorder (CUD). We consider how these methodological factors may contribute to the lack of discovering efficacious medications for CUD. Next, we use meta-analysis to develop the most precise effect size estimates for various pharmacotherapies for CUD.

The Story of N-Acetylcysteine as a Pharmacotherapy for Cannabis Use Disorder

Kevin M. Gray
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The over-the-counter antioxidant N-acetylcysteine (NAC) reduces drug seeking and reinstatement in animal models via effects on glutamate in the nucleus accumbens. Its potential application as a pharmacotherapy in clinical populations has been the focus of recent research, yielding an array of findings across substance use disorders. Specific to cannabis use disorder (CUD), a randomized controlled trial (RCT) in adolescents yielded positive findings, while a subsequent RCT in adults yielded null findings. These discrepant results will be presented and discussed in the context of platform treatments, participant characteristics, and developmental considerations. Ongoing research involving NAC for CUD will be introduced, and the potential role of NAC as an adjunctive pharmacotherapy in the clinical management of CUD will be discussed.

Novel Pharmacotherapy Targets for Cannabis Use Disorder Treatment

Aimee McRae-Clark
Medical University of South Carolina

Previously explored pharmacotherapeutic agents for cannabis use disorder have targeted the serotonergic, dopaminergic, and noradrenergic neurotransmitter systems; however, positive results in clinical trials have been limited to date. This talk will focus on recent data involving novel pharmacologic targets and interventions for cannabis use disorder. Oxytocin is a hypothalamic neuropeptide that has been shown to mediate behavioral responding to stress as well as play a role in neuroadaptations that occur as a consequence of long-term drug use, including modulation of cannabis craving. A growing literature suggests that ovarian hormones also play a key role in drug use, misuse and stress, and that exogenous progesterone may attenuate drug sensitivity and behavior as well as mitigate cannabis withdrawal-induced craving. Finally, varenicline, a selective nicotinic acetylcholine receptor partial agonist of the $\alpha 4\beta 2$ subtype and a full agonist of the $\alpha 7$ subtype, may improve cannabis use outcomes through multiple mechanisms, including interaction with the mesolimbic dopamine system and reduction in withdrawal associated negative affect. Preliminary data on these agents and their potential utility in treatment of cannabis use disorder will be discussed.

Discussant: Matthew R. Pearson
University of New Mexico

Symposium: Marijuana Use and Adolescents: Epidemiology, Policy, and Longitudinal Consequences

Chair: Douglas C. Smith
University of Illinois at Urbana-Champaign

Adolescence is thought to be a developmentally-sensitive period, during which marijuana use may confer a heightened risk for consequences relative to use occurring later in development. This symposium addresses multiple topics related to marijuana use by adolescents, including: optimal screening procedures for heavy marijuana use among adolescents, developmental risk factors in adolescence that predict emerging adult co-use of marijuana and other substances, and whether adolescents residing near medical marijuana dispensaries use more marijuana than those living further away from them. Because research on marijuana among teens is a national priority in our current policy environment, the research in this symposium is critical. These studies use rigorous methods and large datasets to make novel contributions, extending our understanding of screening, risk and protective factors, and the impact of medical marijuana policies on adolescents.

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Sensitivity and Specificity of the CRAFFT to Identify Heavy Cannabis Use: Evidence from a Large Statewide Adolescent Sample

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Background: The CRAFFT (Car, Relax, Alone, Forget, Friends, Trouble, 1999) is one of the most widely used screening instruments for adolescents to diagnose AUD and SUD. This study examined optimal cutoffs for the overall sample, examined subgroup differences, and tested whether using a modified version of the Car item improved its performance. IYS is a self-report survey administered in school settings and is designed to gather information about a variety of health and social indicators including substance use patterns and attitudes of Illinois youth. Methods: Participants were youth who responded to the Illinois Youth Survey (IYS) in 2018. IYS is a statewide survey representative of 6th, 8th, 10th, and 12th grade youth attending public schools in Illinois. A total of 138,214 adolescents (age range, 13-19 years) were included in the analysis. The mean age of the sample was 16.18 (SD 1.205) years with more girls (n = 70,291; 50.9%) than boys (n=65,283; 47.2%). Receiver operating characteristic (ROC) curves were calculated to determine optimal CRAFFT cutoff scores for identifying adolescents with heavy cannabis use (i.e., 10 occasions or more in past 30 days). Optimal cutoffs were those with a

combination of the highest Youden's index alongside sensitivities larger than 0.8. Results: The mean CRAFFT score was 0.739 (SD 1.34), with 5.2% of participants reporting heavy cannabis use. The CRAFFT performed best in the overall sample at a cut score of 2 (sensitivity, 81.17%; specificity, 83.96%) with area under the curve (AUC) of 0.878; 95% confidence interval 0.873 - 0.882. Sensitivity (81.31%), Specificity (85.66%) and AUC (0.896) were not substantially improved by replacing the Car item. Performance of the CRAFFT did/did not differ by gender, race, free and reduced lunch status, or whether the participants lived in rural areas. Conclusions: The CRAFFT has excellent sensitivity and specificity for detecting heavy cannabis use among adolescents. This study is the largest study of the CRAFFT ever conducted, and supports the cutoff of 2 established by other research. Further, it appears that the performance of the CRAFFT is not enhanced by requiring youth to specify if they personally were driving a car under the influence. Subgroup analyses in this very large study generally support the use of the CRAFFT among diverse populations of adolescents.

Adolescent Risk Factors for Marijuana Co-use With Tobacco and Alcohol During Young Adulthood: A 10-year Longitudinal Study

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Given the changing legal landscape of marijuana, studies need to better understand the co-use of marijuana with other substances, including alcohol and tobacco, among young people. We analyzed data from a diverse sample of youth surveyed annually from ages 11 to 21 to assess trajectories of individual, peer, family, and neighborhood factors in middle and high school and the associations of these trajectories with concurrent and sequential co-use at age 21. Concurrent co-use was defined as using both alcohol/marijuana (CAM) or tobacco/marijuana (CTM) in the past month. Sequential co-use was defined as using both alcohol/marijuana (SAM) or tobacco/marijuana (STM) on the same occasion during the past month. Parallel-process piecewise latent growth models evaluated how each developmental trajectory (i.e., middle vs. high

school) across the four domains predicted four types of co-use at age 21. Rates of co-use were 21% for SAM, 10% for CAM, 14% for STM, and 6% for CTM. Increases in perceived peer use during both middle and high school predicted greater SAM and CAM, and for high school, also greater STM and CTM. Increases in sibling use during middle school were associated with greater CTM. Increases in positive expectancies during high school were associated with greater SAM. Greater resistance self-efficacy during middle and high school were associated with lower SAM and STM, and in high school, also with CAM. Perceived peer use and resistance self-efficacy trajectories emerged as primary predictors of co-use across both developmental periods, highlighting the importance of prevention programming addressing peer influence throughout adolescence.

Proximity of Medical Marijuana Dispensaries and Adolescent Marijuana Use

Allison Salisbury, Douglas C. Smith, Shahana Begum
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In the United States, 19 states permit medical marijuana and nine states and the District of Columbia permit fully legal recreational use of marijuana (Marijuana Policy Project, 2019). A central concern that continues to emerge in debates about marijuana policy is whether liberalized marijuana policies will result in increased adolescent marijuana use. To date, there is no evidence that adolescents are increasing their use in states with liberalized policies (Hasin et al., 2015), but these analyses were based on state prevalence estimates. This study extends this research by using a statewide representative epidemiological survey called the Illinois Youth Survey to determine if dispensary location is associated with higher adolescent marijuana use. Methods. Dispensary locations (i.e., zip codes) and license dates were obtained by the Illinois Department of Public Health, which regulates dispensaries. Participant zip codes on the IYS were matched to dispensary location zip codes to determine if adolescents lived nearby a dispensary. We compared past 30 day and past year use of any marijuana. Results. Approximately 13% (n = 1348) of adolescents in

the weighted sample (n=11,259) resided in a zip code with a dispensary. The prevalence of marijuana use (30 day/past year) was 6.6%/9.7%, 10.6%/16.9%, and 20.1%/30.9% for 8th, 10th, and 12th graders in in dispensary zip codes, respectively. However it was 5.2%/8.4%, 13.7%/20.3%, and 26.4%/36.1% for 8th, 10th, and 12th graders youth not in dispensary zip codes, respectively. In sensitivity analyses, we analyzed the non-weighted dataset (N=231,000). Findings diverged where 8th graders in zip codes dispensaries no longer had higher past 30 day and past year prevalence. However, 10th and twelfth graders in this analysis living in dispensary zip codes did. Conclusion/Discussion. Although this study was cross-sectional and used a crude measure of proximity to marijuana dispensaries, findings raise some concerns about the association between the influence of medical marijuana on adolescent marijuana use prevalence. This was especially problematic for 8th graders in our weighted sample, who had higher past month and past year marijuana use if they lived in dispensary zip codes. These findings should be replicated in longitudinal designs with better distance measures.

Symposium: Current Issues in the Measurement of Cannabis Use

Chair: Bradley T. Conner
Colorado State University

While highly controlled lab studies provide exact information regarding cannabis administration, there are a limited number of researchers who are allowed to conduct cannabis administration research. Field research on cannabis use, while more common, is typically limited to self-report on established scales that may be missing key information. The first talk in this symposium will present data collected from regular-to-heavy cannabis users who provided quantity and potency information about their most recent retail cannabis purchase to assess links between cannabis potency and mental and physical health outcomes. The second talk provides data on a feasibility trial of a new smart vaporizer that provides automatic real-time data collection of quantity, potency, and frequency of cannabis concentrate use and allows for survey data collection that is prompted by cannabis use. The

third talk in this symposium will present data comparing measures of cannabis use disorder and cannabis use motives across a sample comprised of both college students and veterans to determine if measures are invariant across samples. The goal of this research is to test whether construct definitions are the same across these two populations. The final study will present a qualitative analysis of data on patterns of cannabis use from a sample of regular-to-heavy recreational cannabis users to elucidate complex patterns of cannabis use across method of administration, time of day, and other key variables.

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The Relation Between Cannabis Potency and Mental and Physical Health Outcomes

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Cannabis use is associated with unwanted health outcomes, including anxiety, depression, poor sleep hygiene, and disrupted cognitive functioning. However, research to date has not been able to disentangle the complexities of these relations, leaving behavioral health service providers lacking clear direction for treatment. A limiting factor may be the common practices for cannabis use assessment. Cannabis use is typically assessed by frequency, even though to estimate the amount of psychoactive compounds ingested potency, quantity, and route of administration should also be assessed. This study, one of the first of its kind, takes an important step in assessing cannabis use by studying the link between cannabis potency and behavioral health (i.e., physical and mental health) outcomes. Data from two studies will be presented. The first study used Facebook recruiting to gather data from 156 regular to heavy cannabis users (44.7% female). In the first study, self-reported data were analyzed using the New Statistics, which focuses on effect sizes and confidence intervals, rather than null hypothesis significance testing. Findings were inconsistent, with some positive, some negative, and some trivial associations across four domains (i.e., demographic variables, cannabis use variables,

mental health, and physical health). The most valuable discovery was the importance of method of administration in understanding the link between potency and health. We observed a "potency valley" (i.e., a range of potencies for which products were not available) between flower potencies and concentrate potencies. Further, collapsing potency data across flower and concentrated cannabis obscured important relations between cannabis potency and behavioral health outcomes. The second study is currently gathering data from customers at retail cannabis locations in Denver, CO. Participants are asked to provide an email address and to allow researchers to photographically record the product information off the labels of the products they had just purchased. The goal of the second study is to replicate findings from the first study while improving on study design issues noted in the initial data collection. We hypothesize that we will replicate findings of links between cannabis potency and mental and physical health outcomes. Findings from both studies suggest that to more fully understand the relation between cannabis potency and behavioral health outcomes, researchers should examine potency separately across routes of administration.

Automatic Realtime Data Collection of Cannabis Use

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Cannabis use is defined by at least four indicators, i.e., frequency, quantity, potency, and route of administration. It is imperative that variables that define cannabis use be distinct from those that define problematic cannabis use to be able to predict beneficial and adverse physical and mental health outcomes resulting from cannabis use. The National Academies of Sciences, Engineering, and Medicine (NAS) reviewed over 10,000 research reports on the health effects of cannabis and concluded that, to date, there is "insufficient evidence to support or refute" (pg. 120) conclusions regarding cannabis' effects on a host of physical and mental health outcomes. One limiting factor in building an evidence base linking cannabis use to health outcomes is the difficulty collecting accurate cannabis use data. Even utilizing the current best practice of

ecological momentary assessment relies on self-reported cannabis use information. Importantly, previous research has shown that participants are unable to accurately report on cannabis quantity and may not know the potency of the products they are consuming. The state-of-the-science today is the GoFire Bluetooth enabled vaporizer, which, for the first time, allows for automatic collection of cannabis use data (i.e., frequency, quantity, potency, and standardized route of administration) without the need for self-report. The GoFire device delivers metered doses of cannabis with known chemical profiles that are tracked in a database linked to an interactive smartphone application (App) where participants can provide information on personal reasons for use (e.g., anxiety, sleep, pain) and efficacy of use for the selected reason. Automatically collecting lab quality dose and schedule data maximizes internal validity, while simultaneously maximizing ecological validity by allowing participants to purchase their own cannabis product to use as they typically would. Additionally, using the GoFire device and app results in the collection of big data that is well-suited for predictive analytics. The present study reports on preliminary data from a pilot study of 20 regular cannabis users from a state with legal recreational cannabis. We will compare cannabis use data to timeline followback data and discuss participants' experiences related to using the device (i.e., satisfaction, reasons for use, effectiveness). The GoFire device has the potential to be a useful tool for cannabis researchers interested in collecting precise cannabis use data without the need for self-report.

Assessing Invariance of Marijuana Motives and Cannabis Use Disorder Assessments in Veterans versus College Students

Morgan L. Sneed, Samuel R. Davis, Theodore J. Fetterling, Mark A. Prince, Bradley T. Conner
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As legislative changes have increased access cannabis for recreational and medicinal purposes, use and the prevalence of cannabis use disorder among veterans have also increased. Research shows that marijuana motives are a predictor of both cannabis use and consequences from cannabis use, including the development of

cannabis use disorder. Research has led to the development of commonly used measures of marijuana motives and cannabis use disorder. Typically, these measures are deployed in research on different samples of the overall population without testing whether the construct definitions underlying these assessments are valid. In other words, researchers assume that different segments of the population (i.e., veterans, civilians, college students) all define marijuana motives the same way, however, very little research has examined the validity of this statement in samples of veterans. Additionally, even within special populations, such as veterans, some research has shown that variations in construct definitions may exist. For instance, research has shown that construct definitions of alcohol use motives differ among veterans based on whether they were deployed (Mansfield et al., 2010). Research has also indicated that factor structures of motives measures may be unstable for both alcohol and cannabis use motives (O'Hara). The current research attempts to determine whether construct definitions are the same across populations and to clarify factor structure stability in a veteran sample. More specifically, we plan to assess invariance of a brief version of the marijuana motives questionnaire (Simons et al., 1998) and the shortened version of the CUDIT-SF (Bonn-Miller et al., 2016) between a sample of 689 of veterans and a sample of 1074 college undergraduates (data are collected and analyses are ongoing). It was hypothesized that measures would, at least, indicate factorial invariance across samples, in accordance with previous findings in the alcohol literature. However, specific hypotheses were not made regarding metric and configural invariance of these measures between these samples as this is the first study we aware of to assess invariance of cannabis measures in these populations and similar findings in the alcohol literature are, at best, mixed. Findings and implications of the results will be discussed.

A Descriptive Study of Cannabis Use Patterns among Adult Users in Colorado

Elizabeth Ballinger-Dix, Jamie E. Parnes, Alexander Tyskiewicz, Bradley T. Conner
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Historically, research on cannabis use has mostly focused on risk factors, dependency issues, and negative consequences among adolescent or college aged users. Legalization of medical and/or recreational cannabis in several states, including Colorado, has led to a growing interest in expanding research to include motives, use patterns, consequences and characteristics of adult recreational cannabis users. While there has been a recent increase in research on differences in use patterns between cannabis users, the majority of published studies have focused on identifying between-group differences between medical marijuana users and recreational marijuana users. One facet of cannabis use that remains understudied is within-group differences in use patterns, particularly among adult recreational users. For example, little is known about how adult recreational users vary in their selection of different products, concentrations, and dosage across different times of day and contexts. The proposed study will use a qualitative approach toward understanding how adult recreational cannabis users differ in their description of frequency, quantity, potency, type of product, and context for use. In order to identify themes in how individuals describe their cannabis use patterns, we will conduct a qualitative analysis of 73 short interviews that were conducted at two live cannabis use events in Denver, Colorado. Our data will be analyzed with ATLAS.ti, a software program that facilitates qualitative data analysis. The first round of coding will be conducted with attribute coding, followed by a second round of magnitude coding, and a third round of descriptive coding. Attribute coding will allow us to identify how demographic characteristics vary across use patterns. Magnitude coding will allow us to identify how users communicate the frequency, potency and dosage of their use. Then, descriptive coding will enable us to identify how users communicate the contextual factors of their use. After each round of coding, codes will be categorized using the organizational features of ATLAS.ti. A final analysis will be conducted to identify themes that illustrate distinct cannabis use patterns across recreational cannabis users. We believe that the results of this study will help to highlight characteristic and use pattern differences across cannabis users. Identifying distinct patterns across adult users may also help

medical professionals and clinicians to differentiate in their approach toward working with clients who engage in cannabis use.

Discussant: Matthew R. Pearson
University of New Mexico

Symposium: Washington State Marijuana Law: In the Forefront of Change

Chair: Louise Kaplan
Washington State University

Washington State has both legalized medical and recreational marijuana and is the only state with the legally authorized role of medical marijuana consultant. This regulatory landscape presents an opportunity to explore a changing culture. This proposed symposium will provide a brief overview of the evolution of Washington State's marijuana laws since medical marijuana was first authorized in 1998, and subsequent implications for healthcare providers and patients. The role of health care professionals who authorize medical marijuana and the role of the medical marijuana consultant will be explained. The results of a statewide research study conducted in 2018 to determine the knowledge, attitudes and practices of health care professionals and medical marijuana consultants will be discussed. A portion of the symposium will describe key findings from this study regarding the sources of information used by health care professionals and medical marijuana consultants to advise patients and make decisions. The final component of the symposium will explore implications of legal access to marijuana for health care professionals and their patients, including those who suffer from chronic pain and use opioids.

Washington State's Unique Medical and
Recreational Marijuana Laws

Louise Kaplan
Washington State University

Washington's original medical marijuana law, created by an initiative of the people in 1998, allowed physicians to authorize medical marijuana use for qualifying patients with valid documentation. In 2007, legislation required the Washington Department of Health to develop

rules to define the law's provision to allow a patient to have a 60-day supply of marijuana. In 2010, the Washington State Legislature expanded the health care professionals who could provide authorizations for medical marijuana use to include advanced registered nurse practitioners, physician assistants, and naturopathic physicians. A 2011 law required a health care professional who provides an authorization to examine a patient, document the debilitating or terminal condition, inform patients of and document other options to treat the condition. Washington State legalized recreational marijuana in 2012 and merged the medical and recreational systems in 2015, at which time the first and only medical marijuana consultant role was created. In this talk, details of this history and an overview of Washington State's current marijuana laws will be described. This includes the state's qualifying conditions, laws which govern health care professionals' decisions to provide an authorization, requirements to become a medical marijuana consultant, and the services a medical marijuana consultant is authorized to provide.

The Washington State Health Care Professional
and Medical Marijuana Study

Louise Kaplan, Janessa Graves
Washington State University

This talk will summarize findings from a 2018 study, entitled "Knowledge, Practices and Attitudes Regarding Marijuana for Medical Conditions among Washington State Healthcare Providers and Certified Marijuana Consultants." The study consists of two cross-sectional, mixed mode surveys examining the knowledge, attitudes and practices of key players in the authorization and distribution of medical marijuana in Washington State: medical marijuana consultants and healthcare providers. Medical marijuana consultant survey: This cross-sectional, mixed mode survey was administered to a random sample of 360 medical marijuana consultants (32% response rate). Most respondents (84%-100%) correctly identified conditions that qualify a patient to receive a medical marijuana authorization with fewer (8%-31%) accurately identifying conditions that do not qualify for an authorization such as depression

and anxiety. Three-quarters or more correctly identified the amount a patient could possess, that health plans are not liable for claims for reimbursement, all children under age 18 must be in the database, and employers are not required to make an accommodation for medical marijuana use. Almost all identified the aspects of the consultant role they are legally authorized to perform and those they are not. Almost one-quarter, however, did not know they may provide instruction and demonstration of proper use of marijuana products. Attitudes strongly supported DEA reclassification of marijuana to no longer be a schedule I drug, medical marijuana should be incorporated into healthcare provider education, marijuana helps patient with chronic debilitating conditions, and that it provides significant physical and mental health benefits. Health care professional survey: This cross-sectional, mixed mode survey was administered to a random stratified sample of 1800 medical doctors, nurse practitioners, physician assistants (27.7% response rate). Depending on the condition, 29% to 93% of health care professionals correctly identified whether or not the condition qualified a patient to receive a medical marijuana authorization. A narrower range (21%-51%) accurately identified conditions that do not qualify for an authorization, such as anxiety and depression. Depending on the condition, 4% to 45% of respondents indicated they "did not know" whether a condition qualified. Only 57 participants (13.6%) had ever issued an authorization for medical marijuana. Over half (58%) who had not issued authorizations felt they lacked skills and knowledge to provide them. More than one-third (38%) reported their practice had a policy prohibiting medical marijuana authorizations. Attitudes varied widely although 75% somewhat or strongly agreed marijuana helps patients who suffer chronic, debilitating medical conditions. Over half (62%) strongly or somewhat agreed the Drug Enforcement Agency should reschedule marijuana to make it legal at the federal level. Policy recommendations include evaluation of the medical marijuana consultant role to determine if the role fulfills its intended purpose or if revision is needed; if the consultants adhere to the law; consultant satisfaction with the role; and customer satisfaction with the services. Regulators should consider a requirement for health professional education to incorporate evidence-based information into curricula. Another proposed change would be to develop requirements specific to authorizations for special populations such as pregnant women and children.

Sources of Information Used by Washington State Health Care Professionals and Medical Marijuana Consultants: Has Science Gone up in Smoke?

Tracy Klein
Washington State University

The 2018 study that will be discussed in Talk 2 of the symposium included a series of questions regarding the sources of information the medical marijuana consultants and health care professionals utilize to evaluate the risks and benefits of medical marijuana. Medical marijuana consultants reported their top three sources of information as their certification training course (85%), other consultants (72%), patients (68%), and websites (55%). Scientific journals were identified as sources of information for marijuana risks and benefits by only 14% of consultants. In contrast, health care professionals reported other licensed health care professionals (64%) and continuing education (47%) were the most frequently reported sources of information. Reports from patients and scientific journals each were utilized by 31% of the respondents, and websites by 22%. This talk will summarize findings of information preferences from these surveys and outline recommendations for improving the quality of and access to evidence-based materials for medical marijuana consultants and health care providers. Work groups can be formed to critique and update sources of evidence to provide health care professionals and medical marijuana consultants.

Implications of Washington State's Marijuana Laws for Health Care Professionals and Patients

Marian Wilson, Tracy Klein
Washington State University

This presentation compares the perspectives of patients, providers, and marijuana consultants regarding cannabis use for symptom management, and provides a framework for

patient-centered shared decision-making regarding cannabis use. Results from the 2018 study described in this symposium will be compared with data from a 2016-2017 survey of marijuana use among adult patients in Washington State receiving opioids for chronic pain or opioid use disorder. A conceptual framework will be presented to depict commonalities and differences between the three populations examined. The 2016-2017 survey of Washington State adults included 300 patients, 388 providers, and 118 marijuana consultants. Pain was the symptom most commonly targeted by patients, followed by sleep, anxiety, and drug withdrawal. Most providers (85%) reported never authorizing cannabis for medical use, citing multiple factors including lack of knowledge and skill. Common themes from the data sets included cannabis benefits, adverse effects, and knowledge gaps. Benefits and harms of cannabis were mentioned in all groups. Medical marijuana consultants endorsed few risks; 28% of consultants believed cannabis can be addictive, compared to 69% of providers. Significant knowledge gaps involved identifying mental health conditions that do not qualify for cannabis authorizations (e.g. depression and anxiety). All groups mentioned cannabis should be more accessible. Implications include that understanding perspectives of stakeholders can assist in patient-centered shared decision making for treatment planning regarding cannabis use. Discussion of the meaning of the data will conclude the symposium. For example, what does it mean for patient care when providers do not believe cannabis helps pain or that cannabis can be addictive? How should clinicians manage conflicting viewpoints? How should patients share their preferences?

Discussant: Louise Kaplan
Washington State University

Symposium: What People Think About the Effects of Cannabis: A Balanced View of Perceived Risks and Benefits

Chair: Benjamin Ladd
Washington State University

Perceptions of risks and benefits of cannabis abound; many lay claims have mixed empirical support or lack support altogether. These perceptions have important implications in terms of cannabis use and health. Furthermore, research on the effects of cannabis often is one-sided and emphasizes only the negative consequences of cannabis use. This likely contributes to an incomplete picture of the factors related to cannabis use decision-making. This set of talks describe recent efforts to improve understanding of perceptions of cannabis health effects by taking a balanced approach to studying perceived risks as well as benefits in a range of populations. Dr. Fales will examine the perceived benefit of cannabis to manage pain in young adults with and without chronic pain. Dr. Teeters will explore the role of positive and negative expectancies of cannabis use on decisions to drive after having used. Ms. Pritschmann will look at cannabis and cannabis-free reinforcement and cannabis outcomes from a behavioral economic perspective. Finally, Dr. Magnan will examine prevalence and endorsement of users' and nonusers' beliefs around various positive and negative health consequences of cannabis. The goal of this symposium is to improve understanding of current perceptions of risks and benefits related to cannabis use and relative ratios of these two aspects in order to identify areas for future research inquiry (e.g., common anecdotal claims lacking scientific study) as well as establish potentially useful targets for intervention and prevention (e.g., correcting inaccurate beliefs, associations between motivations for use and cannabis-related harm).

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Young Adults Are Using Recreational Cannabis Products to Manage Their Pain: It Might Not Be Helping Them

Jessica Fales
Washington State University

As estimated 100 million Americans experience chronic pain each year at an annual cost exceeding $600 billion. Defined as physical pain that persists or recurs past the time of expected healing, chronic pain is associated with a wide range of negative sequelae including disruptions in mood, sleep problems, limitations in physical

activities, and impairment in interpersonal relationships. Although the past decade has seen a tremendous increase in evidence-based treatment options for chronic pain, few have access to specialty pain care. This is especially true for young people, whose pain has historically been under-recognized and undertreated. Cannabis is commonly used recreationally among adolescents and young adults (AYAs) and - due to widespread beliefs about its pain relieving properties - it may be a drug of choice for AYAs experiencing chronic pain. The present study determines whether pain relief is an important motivation for use among AYA recreational users and compares depressive symptoms, sleep problems, and health related quality of life in users with and without persistent pain. AYA recreational cannabis users (N = 202; 18-29 years of age; M = 24.22, SD = 2.71; 43% female; 73% Caucasian) were recruited from communities in the Pacific Northwest to participate in a study investigating their cannabis use and health. All were weekly or more frequent users (74% reported daily or multiple times daily use). All completed a set of questionnaires assessing their cannabis use and pain history (including pain-related interference; PROMIS-PI), motivations for cannabis use, depressive symptoms (CES-D), sleep problems (PSQI) and health-related quality of life (SF-36). Pain problems were surprisingly common in our sample. Approximately half reported a weekly pain problem of at least 3 months duration (51%; M usual pain intensity = 5.67, SD = 1.82; 0-10 Numerical Rating Scale) and a quarter (27.2%) reported chronic pain accompanied by clinically significant pain-related interference. Among all users, pain relief was rated as a somewhat important motivation for use; however, it was the primary motivation for use among users with chronic pain [F(1,200) = 119.58, p< .001]. Compared to users without pain, users with chronic pain reported more clinically significant sleep problems (77% vs. 29%; χ2 = 45.60, p < .001) and depressive symptoms (67% vs. 26%; χ2 = 34.48, p< .001). They also reported worse health-related quality of life across nearly all domains, including poorer physical functioning [F(1, 200) = 30.96, p<.001] and social functioning [F(1,200)=23.82, p<.001]. While users with disabling chronic pain reported the highest symptoms and worst quality of life, users with non-disabling chronic pain were also significantly

distinguishable from AYA without pain on nearly all assessed outcomes. Findings highlight that a number of young adult recreational users may be using cannabis products for the express purpose of relieving pain. Despite frequent cannabis use, many AYA report experiencing significant pain and pain-related interference alongside elevated depressive symptoms, poor sleep quality, and poor health-related quality of life. Clinical implications and study limitations will be discussed.

Negative Marijuana Expectancies are Associated with Driving after Marijuana Use

Jenni B. Teeters, Matthew J. Woodward, Shelby King
Western Kentucky University

Background: Marijuana is the most prevalent illicit substance detected among drug-impaired drivers and the most frequently used illicit drug on college campuses. Though years of epidemiological and experimental research has demonstrated that marijuana use impairs driving ability and increases risk for traffic accidents, college students perceive driving after marijuana use as more acceptable and less dangerous than driving after drinking. Additionally, a subset of marijuana users perceive that using marijuana actually improves their driving and other abilities. Thus, a potential explanation for the perceptions of decreased risk associated with driving after marijuana use is an individual's expectancies about the effects of marijuana use, which may in turn influence the decision about whether to drive after use. Consequently, the aim of the present study is to determine whether marijuana expectancies are associated with driving after marijuana use. Method: Participants were 94 college student marijuana users enrolled in a pilot trial of a mobile-phone based intervention aimed at reducing driving after substance use. All participants completed measures of marijuana use frequency, driving after substance use, and the Marijuana Expectancies Questionnaire-Brief (MEEQ-B). The MEEQ-B consists of 6-items that measure participants' level of agreement with assertations about marijuana's effects and has two subscales: Positive Expectancies and Negative Expectancies. Pearson's correlations were used to examine the associations between marijuana expectancies and

driving after marijuana use. Negative binomial regressions were then utilized to assess whether positive and negative expectancies were associated with the number of times driving after marijuana use after accounting for control variables. Results: Pearson's correlations revealed that stronger endorsement of the expectancies "Marijuana makes it harder to think and do things" and "Marijuana generally has bad effects on a person" showed significant negative correlations with the number of times driving after marijuana use ($r = -.34$ and $-.23$, respectively). Additionally, the negative expectancies subscale demonstrated a significant negative correlation with the number of times driving after marijuana use ($r = -.35$). Notably, positive expectancies of marijuana use were not significantly correlated with driving after marijuana use. Results of a negative binomial regression controlling for age, gender, ethnicity, and the number of days using marijuana in the past month revealed that the negative expectancies subscale, but not the positive expectancies subscale, was significantly associated with likelihood of driving after marijuana use (IRR: .664, p<.01). Conclusions: Past research has indicated that positive marijuana expectancies are related to greater frequency of use and problems while negative marijuana expectancies are related to non-use and lower endorsement of negative consequences. Results of the present study add to this growing body of literature by demonstrating that marijuana use expectancies play a role in the decision to drive after using marijuana, arguably the most immediately dangerous consequence associated with marijuana use. With increased legalization of recreational and medical marijuana, it is becoming increasingly important to understand factors related to driving after marijuana use. Our findings suggest that negative expectancies related to marijuana use may be an important prevention and intervention target.

Associations Between Behavioral Economic Reward Value, Expectancies and Cannabis Use Outcomes

Ricarda Pritschmann, Ali Yurasek
University of Florida

Cannabis is one of the most widely used drugs on college campuses and is associated with Cannabis Use Disorders (CUDs), poor academic achievement and other consequences. However, students often report cannabis as beneficial for sleep, anxiety and stress. Students who anticipate more positive outcomes from cannabis use often use more, have difficulty cutting down, and show higher rates of CUDs, compared to those who expect more negative outcomes. Behavioral economic theory is often used to identify predictors of substance use and may help disentangle the relationship between cannabis use and its perceived benefits and risks. The behavioral economic concept of reward value captures the degree of preference for a reinforcer like cannabis and suggests that use is influenced by 1) its relative availability and price and 2) alternative cannabis-free sources of reinforcement. Reinforcement Ratio (RR) is one measure of reward value that assesses relative levels of substance-free and substance-involved activity participation and enjoyment; whereas demand curve measures of reward value assess consumption levels across a range of prices. In general, higher levels of reward value are related to greater cannabis use, problems, and CUD severity. Some research has also linked reward value, specifically cannabis demand, to negative and positive perceptions of cannabis use outcomes suggesting elevated demand is associated with lower negative expectancies (NE) and higher positive expectancies (PE) of cannabis use outcomes in adults. Despite these associations, it remains unclear whether reward value, including RR, influences cannabis expectancies among college students and whether these variables jointly predict cannabis related outcomes (i.e., consequences). PURPOSE. The purpose of this study was to investigate whether cannabis reward value is related to positive and negative cannabis expectancies, and the influence of these variables on cannabis-related problems and CUD symptoms in a college student sample. METHODS. Eligible students (N = 221) were between the ages of 18-25 (Mage = 19.9; SD = 1.36) and reported using cannabis at least 3 times in the past month (Mdays = 10.65; SD = 8.3). Participants completed a series of questionnaires related to their use including the Marijuana Effect Expectancy Questionnaire-Brief (MEEQ-B), the Marijuana Purchase Task (MPT), the Adolescent

Reinforcement Survey Schedule (ARSS), a DSM-5 CUD symptom checklist, and the Kilmer-Lee Marijuana Consequences scale (KLMC). A series of hierarchical regressions controlling for marijuana use days, age and sex were conducted. RESULTS. Analyses indicated that higher elasticity of demand (less consumption as price increases) predicted greater NE, and lower elasticity predicted greater PE. Greater RR predicted lower NE, but was not significantly related to PE. Finally, greater NE and RR predicted more consequences and CUD symptoms. CONCLUSION. Findings suggest that students who more highly value cannabis also report more positive expectancies and fewer negative expectancies associated with their cannabis use. Furthermore, higher NE and RR was related to greater problem use. This may suggest that students with more severe cannabis use may be more likely to expect negative consequences but have fewer alternatives to using. Prospective studies are needed to better understand the temporal order of these variables however.

Identifying Perceptions of Risks and Benefits of Cannabis Use: Associations with Cannabis Use and Related Problems

Renee E. Magnan, Eric Malain, Benjamin Ladd
Washington State University

Perceived risk of behavior is commonly studied in health-decision making, but far less is understood about the role of perceived benefits. Cannabis use might be a particularly important target for investigating the competing roles of perceptions of risks and benefits given recent dramatic shifts in public acceptability, accessibility, and common misinformation about its use. Moreover, cannabis use is an ambiguous health behavior which could result in benefits (e.g., pain modulation) in addition to harms (e.g., addiction). A clearer, balanced understanding of perceived risks and benefits of cannabis use will provide targets for intervention development to increase accuracy of cannabis risk estimates, inform cannabis decision-making, and prevent cannabis-related problems. Across two studies, we identified perceptions of risks and benefits of cannabis use and examined the association of these perceptions with cannabis use frequency and related

problems. In Study 1, adult cannabis users (N = 96) who used at least twice a week, indicated their cannabis use and related problems, and then evaluated their perceptions of risks and benefits related to personal harms/benefits, negative/positive health outcomes, negative/positive mental health outcomes, and harming/benefitting others. Perceptions of personal risks were low while perceptions of benefits were relatively high. Perceptions of risks, but not benefits, were associated with problem severity (r = .44, p < .001). Neither were associated with use. In Study 2, college students (N = 399) viewed 21 possible positive and 28 possible negative consequences of cannabis use and indicated if they thought each consequence was true. On average, participants thought 48% of the positive consequences and 65% of the negative consequences were true. The most and least endorsed negative consequences were its cost (92.5%) and cause of seizures (21.1%), respectively. The most and least endorsed positive consequence was relieving pain (94.7%) and protecting against memory loss (7.5%), respectively. Frequency of use and marijuana problems were negatively associated with the number of negative consequences endorsed (r = -.21, -.31, ps < .001, respectively) and positively associated with number of benefits endorsed (r = .37, .29, ps < .001, respectively). Moreover, those who used more frequently were more confident in the benefits of use (r = .13, p = .01). Taken together, these findings suggest that people are aware of potential risks of use but may not perceive these as personally relevant. We will discuss the implications of these findings in terms of public education and highlight specific areas upon which such communications could focus to correct misperceptions.

Discussant: Benjamin Ladd
Washington State University

Symposium: Changing Marijuana Policy and its Potential Impact on Unintentional Injury

Chair: Renee M. Johnson
Johns Hopkins University

Unintentional injuries are the leading cause of death for people aged 1-44 in the US. This symposium will provide a forum to examine the

potential impacts of changing marijuana laws in the US on unintentional injury. The Chair will introduce the symposium and give an overview of the epidemiology of marijuana-associated injury, with a focus on traffic safety and poisoning (i.e., unintentional ingestion or overingestion of cannabis). The first presentation will address adolescent use of emerging modes of marijuana in Colorado. High levels of edible use, dabbing, and smoking may increase risk for overingestion and burns. The second presentation is a study of Colorado adults and describes their driving after having consumed marijuana. The third presentation builds on findings that pediatric healthcare contacts resulting from marijuana exposure increased in Colorado and Washington State following passage of recreational marijuana laws (RMLs); it presents an investigation of marijuana-related poison center calls among 0-24 year olds in Massachusetts. Storing poisonous substances in a manner that prevents child access has been an important strategy for poisoning prevention and is well-integrated into physician-based education for parents. The fourth presentation focuses on how Colorado parents store marijuana to gauge risk for childhood poisoning in the state. The Discussant will highlight key themes across the presentations and will discuss policy implications, present recommendations for injury prevention, describe key sources of data, and highlight gaps in knowledge.

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Modes of Marijuana Consumption Among Colorado High School Students

Renee M. Johnson, Ashley Brooks-Russell
Johns Hopkins University, University of Colorado Denver

The purpose of this presentation is to characterize Colorado adolescents' modes of marijuana consumption. Data are from the 2017 Healthy Kids Colorado Survey (HKCS), a state adolescent health surveillance system. Among youth who report past 30-day marijuana use, we describe modes of marijuana consumption and examine variation by grade, race/ethnicity, sex, sexual minority status, and frequency of use. More than three-quarters (77.8%) reported that smoking was

how they usually consumed marijuana, whereas 9.8% reporting vaping and 4% reporting edibles as their usual modes. The prevalence of smoking as a usual mode of use was lowest among 9th graders (87.3%) and highest among 12th graders (94.6%). Sixty percent reported use of just one mode in the past 30 days; 40% used 2 or more modes, usually smoking along with another mode. More than one-third reported any past 30-day consumption of edibles (35.6%) and dabbing (34.4%), and 20.3% reported vaping. Findings suggests that Colorado high school students who have used marijuana in the past 30 days use a variety of modes of consumption.

Driving After Cannabis Use and Perceived Impairment Among Colorado Adults

Ashley Brooks-Russell
University of Colorado Denver

In the context of a state with legal recreational cannabis use, we surveyed a large number of current and frequent cannabis users about their driving after cannabis use. Data are from an online survey conducted between July, 2018 and April, 2019 with the primary goal of screening participants for a larger study on cannabis-impaired driving. Participants were asked if the research team could retain their survey responses regardless of eligibility for the larger study. Of 3,282 surveys initiated, 1,568 did not finish the survey, which included extensive inclusion and exclusion criteria for the larger study, or declined their responses be retained. Of the 1,714 surveys with complete data, 82.6% (1,415) reported past 30-day cannabis use, 77.1% of whom reported near daily or daily use (i.e., use of >20 days in the past month). Among those who used cannabis 1-10 days in the past month, 26.6% reporting driving after using cannabis on 1-10 days. Among those who reported cannabis use on >20 days in the past month, 36.8% reporting driving after using cannabis on 20 or more days in the past month. A majority of respondents reported that cannabis use "did not affect their driving" and between >15% said that cannabis use made them drive better. More than one-third said they would use less cannabis if they knew they would be driving within two hours. There was wide endorsement of compensatory driving behaviors, including: "try to pay more attention to my speed,"

endorsed by 87.5% to 93.8%; "increase the distance from the vehicle in front of me," endorsed by 79.1% to 89.6%; and "drive slower," endorsed by between 69.7% and 83.3%, depending on cannabis use frequency. In summary, respondents reported driving after cannabis use and indicated that they did not perceive that cannabis use impaired driving ability. However, respondents also reported moderating cannabis use before driving and engaging in compensatory driving behaviors when driving after cannabis use, which suggests an implicit acknowledgement that cannabis use does impair driving ability. Further exploration of the discrepancies of these behaviors can information prevention messages and intervention strategies to prevent impaired driving.

Marijuana-related Poison Center Calls Among 0-24 Year Olds in Massachusetts Before and After Medical Marijuana Legalization

Jennifer M. Whitehill, Calla Harrington, Cheryl Lang, Michael Chary, Waqaas A. Bhutta, Michele M. Burns
University of Massachusetts Amherst, Boston Children's Hospital, Brigham and Women's Hospital

Pediatric healthcare contacts resulting from marijuana exposure increased in Colorado and Washington State following changes in marijuana policy; data on whether this was the case in other states is limited. The purpose of this study is to document child and adolescent marijuana exposures reported to the regional Poison Control Center (PCC) before and after the 2012 passage of a medical marijuana law (MML) in Massachusetts. We conducted a pre-post comparison of marijuana-involved PCC cases for 0-24 year olds, examining four years before and after MML. From 2009-2016, there were 311 calls to the PCC involving cannabis (n=118 single substance; n=193 polysubstance). The average annual prevalence of single-substance cannabis calls increased 150%, from 0.4 per 100,000 before to 1.0 per 100,000 after. There was an increase for all age subgroups, and 15-19 year olds had the highest rate of PCC-reported marijuana exposures. The proportion of all PCC calls that were due to single-substance marijuana exposure increased. Exposures related to edible marijuana

products increased after MML for most age groups. Child and adolescent cannabis exposures increased in Massachusetts after medical marijuana was legalized, despite childproof packaging and warning labels to keep the products away from youth. MMLs are associated with increases in cannabis-related poisoning among very young children and overingestion by adolescents. Our findings extend prior work by demonstrating that youth are also experiencing increased cannabis-related health system contacts via poison control centers. Given the growth of retail cannabis sales, including edibles and potables, additional efforts are needed to prevent poisonings among children and youth.

Storage of Marijuana in the Home and Unintentional Ingestion Among Children

Janessa M. Graves, Ashley Brooks-Russell
Washington State University, University of Colorado Denver

Within the context of a legal recreational cannabis state, we examined the prevalence of cannabis products in homes with children to estimate the potential exposure in the population. We also investigated temporal trends in storage practices among caregivers and storage practices by caregiver characteristics. Data are from a population-based telephone survey of caregivers of children aged 1-14 years in Colorado, administered annually from 2014 to 2017. Reponses are weighted to the population of Colorado. Representing 79,805 households in Colorado with children aged 1 to 14 years, 8.6% (95% CI: 7.3-10.0) of caregivers reported cannabis stored in the home. Overall, 3.8% (95% CI: 2.9-4.6) of caregivers reported cannabis was used in the home; there was minimal variation by demographic factors. From 2014 to 2017, the prevalence of caregivers reporting cannabis in or around the home increased significantly from 6.9% (95% CI 4.9-8.9) to 11.2% (95% CI: 8.2-14.5) (P=.02); however, caregivers-reported cannabis use remained unchanged. Among caregivers who reported cannabis in the home, 91.4%, (95% CI 87.4-95.4) reported storage locations inaccessible to children, such as "out of reach." Two-thirds (67.0%, 95% CI: 59.6-74.4) reported storage in a locked container, such as a cabinet, drawer, or safe. In a US state with legalized recreational

marijuana for adults, an increasing number of children live in homes where cannabis is present; leaving children at risk for unintentional ingestion. Clinicians should promote messages to caregivers about safe cannabis storage practices to prevent unintentional ingestion.

Discussant: Ashley Brooks-Russell
University of Colorado Denver

Symposium: Ecological Momentary Assessment of Cannabis: Lessons Learned from Microlongitudinal Studies

Chair: Noah N. Emery
Brown University

Ecological momentary assessment (EMA; Shiffman, 2009) leverages intensive repeated measures to capture moment-to-moment fluctuations in emotional, cognitive, and behavioral experiences in near real-time while participants are in their natural environment. This allows researchers to establish temporal precedence between variables of interest and to model differences between closely spaced successive time points across a single day or a series of days. As such, these microlongitudinal designs are uniquely suited to rapidly address key gaps in the literature. In the current symposium, we review cutting edge EMA research on how systematic changes in advance of quitting cannabis contribute to improved success rates during a quit attempt (Shrier et al.); we examine the effects cannabis use on sleep and social activity in older persons living with HIV (Henry et al.); we investigate the effects of cannabis use on the time course of positive and negative affect (Emery et al.); we examine how context of use moderates the relationship between use frequency and hazardous use (Wedel & Ansell); and review EMA data can be used to individualize treatment of cannabis use disorder (Litt). Finally, given her extensive experience using EMA to study the etiology and treatment of cannabis use, our discussant will provide a unique synthesis of these talks (Collins). Taken together, our symposium presents a wide range of EMA research on cannabis use, highlighting the diversity of research questions that can be answered using microlongitudinal designs.

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Changes in Cannabis Use-related Factors Prior to a Self-Quit Attempt

Lydia A. Shrier, Ziming Xuan, Sion Kim Harris
Boston University, Boston Children's
Hospital/Harvard Medical School

Young adults who use cannabis heavily often attempt to quit on their own and may try several times before achieving cessation. Preparing to quit may increase the likelihood that abstinence will be achieved. However, little is known about the process of preparing to quit in this population and how that process relates to patterns of use during the quit attempt. Using Ecological Momentary Assessment (EMA; Shiffman, 2009), we examined cannabis use and use-related factors for two weeks before and two weeks during a self-quit attempt in a community sample of 18-25 year olds reporting daily/near-daily cannabis use and planning to quit. We instructed participants to use cannabis as they usually do during the pre-quit period ("usual use"). During both the pre-quit and quit attempt periods, we assessed momentary positive and negative affect, craving, availability, situational permissibility, confidence to not use, and characteristics of cannabis use events (social and temporal contexts, reason, feelings about use) in response to 6 prompts at random times each day, as well as a scheduled diary of symptoms of cannabis withdrawal and cannabis use in the past 24 hours. We had previously identified that situational permissibility in the two weeks before trying to quit was the only averaged EMA variable that contributed to a model predicting lapse during the attempted abstinence period (Shrier et al., 2018). Additionally, we had observed that cannabis use frequency declined over the two weeks before the quit date. To better understand the process of preparing to quit, we sought to determine whether participants (N=34) experienced changes in cannabis use-related factors during the pre-quit period, and whether these changes predicted time to lapse and cannabis use frequency during the quit attempt period. We found that several EMA variables changed from the first week to the second week prior to the quit attempt, including decreases in positive affect, frequency of cannabis craving,

cannabis availability, situational permissibility, cannabis use since last report, bad feeling following use, and cannabis withdrawal symptoms, and increase in confidence to not use cannabis (all ps<0.05). On linear regression modeling, decline in use days from the first to the second week of the pre-quit period was associated with fewer use days during the quit attempt period (beta=5.90, p=0.04), adjusting for pre-quit change in confidence. Pre-quit changes did not predict time to lapse or cannabis use frequency during the 2-week quit attempt period for any other cannabis use-related EMA variables. The study was limited by its small sample size and prescribed quit date. In summary, young adults preparing to quit cannabis in the context of a research study demonstrated changes in advance of quitting that may reflect preparatory actions. Only the often-recommended strategy of reducing use of a substance prior to attempting cessation was associated with improved success with trying not to use cannabis following a quit date. Further EMA research on changes in anticipation of cannabis cessation will be important for developing effective pre-quit tools and strategies to aid young adults using cannabis heavily to successfully abstain.

Ecological Momentary Assessment of Cannabis Use in Older Persons Living with HIV: Relationships with Sleep and Social Activity

Brook L. Henry, Laura M. Campbell, Jessica L. Montoya, Emily W. Paolillo, Bin Tang, Caitlin Wei-Ming Watson, Raeanne C. Moore
University of California San Diego

Background: Substance use, including cannabis, is elevated in persons living with HIV (PLHIV). Older PLHIV also have impaired sleep and reduced social activity when compared to demographically-matched older persons without HIV (HIV-). Smartphone-based ecological momentary assessment (EMA) can help elucidate the real-time associates between cannabis use and other behaviors, such as sleep and social activity, among PLHIV. This report includes two studies. Study 1 explored the association between cannabis use reported via EMA and objective measures of sleep. Study 2 explored the concurrent association between substance use and social activity. Methods: Fifty-nine older PLHIV and 35 HIV-negative adults (50-74 years) completed up to four EMA surveys per day for 14 days. Via EMA surveys, participants reported substance use, current social activity (alone vs being with others), ratings around social interactions (perceptions of satisfaction, success, and feeling liked), and mood ratings. Participants also wore actigraphy watches to objectively assess sleep quality (i.e., total sleep time, efficiency, fragmentation, movement, wake after sleep onset, and number of awakenings). Study 1 included a subset of study participants (11 PLHIV, 6 HIV-) who had actigraphy data and reported cannabis use at least once during the EMA study period. Linear mixed-effects models were used to examine the association between cannabis use and subsequent sleep. Study 2 included participants who endorsed using cannabis more than once during the 14-day EMA period (11 PLHIV, 4 HIV-). Ratings of social interactions were averaged and a dichotomous variable was created indicating lower vs higher social interaction ratings. Separate mixed-effects logistic regression models were tested to evaluate whether cannabis use predicted current (within-survey associations) social activity and ratings of social interactions. Random intercepts were specified for participants; covariates included time of day, HIV status, and mood ratings. Results: In Study 1, self-reported cannabis use via EMA was significantly associated with greater total sleep time (p=0.02) in models adjusting for day of the study and alcohol use. However, cannabis use was also associated with greater number of awakenings at trend-level (p=0.07). Study 2 indicated that cannabis use was associated with an increased likelihood of being with others at a trend-level of significance (OR=1.43, p=.06) and with a higher likelihood of having higher ratings of social interactions (OR=2.68, p=.01). The effect of HIV serostatus was non-significant in all models. Conclusions: These preliminary results indicate cannabis use may have both positive and negative effects on sleep and a positive effect on social activity. Future studies with larger sample sizes that also assess cannabis use in more detail (e.g., quantity, route of administration, reason for use) are needed to further understand these dynamic relationships.

The Effect of Marijuana Use on the Time Course of Positive and Negative Affect in Daily Life

Noah N. Emery, Ryan W. Carpenter, Robert
Miranda, Jr
Brown University

Theoretical accounts of the relationship between affect and substance use suggest that marijuana is often consumed as a form of affect regulation due to its positive or negative reinforcing qualities (Cooper & Haney, 2008; Simons et al., 1998). However, ecological momentary assessment (EMA) research on associations between affect and marijuana use in daily life has predominantly focused on whether positive and negative affect serve as stimuli for increased use (Wycoff et al., 2018). Fewer studies have tested whether marijuana use is associated with subsequent reductions in negative affect (NA) or increases in positive affect (PA). While there is strong theoretical rationale for these affective alterations, results from (EMA) research in this area are mixed, with studies reporting decreased NA, no effect on either NA or PA, or even increased NA after use (Buckner et al., 2015, 2012; Ross et al., 2018). This suggests that there are unanswered questions regarding the emotional payoff of marijuana use. In the present research, we used EMA data from 85 treatment seeking youth age 15-24 to model the time course of affect and tested within- and between- person factors that could moderate associations between successive assessments of negative and positive affect. Our objectives were to: 1) test if marijuana use attenuates associations between successive assessments of negative affect; 2) test if marijuana use potentiates associations between successive assessments of positive affect; and 3) to investigate if the above within-person effects vary across gender, to advance understanding of gender differences in vulnerability for and maintenance of cannabis use disorder. We estimated two multilevel models (Three-levels; moments, days, persons) for positive and negative affect, respectively. The core of each model was an autoregression of affect regressed on lagged affect. Each included a random slope of lagged affect at the person-level and random intercepts at person- and day-levels. Residuals followed an AR-1 autoregressive structure. Use was a dichotomous lagged predictor. We included a quadratic effect for lagged affect in each model because the persistence of affective states over time may vary

by intensity. For the NA model, there was a significant quadratic interaction between lagged NA and lagged use, such that use at the previous moment was associated with decreased levels of NA at the next moment and this effect became increasing pronounced as lagged NA increased. Similarly, the PA model had a significant quadratic interaction between lagged PA and lagged use, such that use at the previous moment was associated with increased levels of PA at the next moment and this effect became increasing pronounced as lagged PA increased. Gender did not exhibit significant effects in either model. These findings are consistent with affective models of substance use. Marijuana use had inverse associations with next-moment NA and positive associations with next-moment PA. In each case, these effects increased in magnitude at higher levels of affective arousal during the previous moment. The results add to the literature on associations between affect and use by examining the often-overlooked part of reinforcement models (i.e. changes in affect following use).

*Solitary Cannabis Use Moderates the
Relationship Between Use Frequency and
Hazardous Cannabis Use*

Amelia V. Wedel, Emily B. Ansell
Syracuse University

*Individualized Assessment and Treatment
Program (IATP) for Cannabis Use Disorder:
Randomized Controlled Trial With and Without
Contingency Management*

Mark Litt
University of Connecticut

*Discussant: R. Lorraine Collins
University at Buffalo*

Symposium: Medical and Recreational Marijuana Laws in Adolescents and Young Adults: Where Do We Go from Here?

Chair: Silvia Martins
Columbia University

Our symposium will present some of the latest findings of epidemiologic studies to identify

changes in marijuana use and marijuana use disorder following marijuana policy changes in the United States. First, our symposium will address consequences of marijuana medical and recreational legalization in the US. Dr. Martins' study will present on data on marijuana use and opioid use after medical legalization using data obtained from the National Survey on Drug Use and Health (NSDUH) restricted use files, to examine these relationships across the 50 states from 2004-2016. She will also show changes in the prevalence, incidence and frequency of marijuana use and prevalence of marijuana use disorder changed following legalization of recreational marijuana use in Colorado, Washington, Alaska and Oregon from 2011 to 2016. Dr. Dilley's study will report on findings about adolescent groups who are relatively more at-risk following legalization. She will present on data from a study of the role of community policies on cannabis use and related public health outcomes following legalization in the Pacific Northwest (Oregon and Washington state). Dr. Johnson's study will characterize adolescents' reports of the modes of marijuana consumption in the early years of retail marijuana sales in Colorado, Washington, and Oregon. Data are from large, state-representative adolescent health surveillance systems, i.e., the Healthy Kids Colorado Surveys (HKCS), the Washington Healthy Youth Survey (HYS), and the Oregon Healthy Teens Survey (OHTS). Finally, Dr. Mauro will present associations between medical marijuana law (MML) status and screening/discussing marijuana or illegal drug use with health care providers in a nationally representative sample.

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Medical and Recreational Marijuana Laws: Effects on Marijuana and Opioid Outcomes in Adolescents and Young Adults

Silvia Martins, Pia Mauro, Christine Mauro, Luis Segura, Magdalena Cerda, Katherine Keyes, Morgan Philbin, Natalie Levy, Ava Hamilton, Melanie Wall, Deborah Hasin
Columbia University, New York University

Getting Into the Weeds: Identification of Youth At-risk Following Retail Cannabis Legalization in the Pacific Northwest

Julia Dilley
Oregon Health Authority

Modes of Marijuana Consumption Among High School Students in Colorado, Washington, and Oregon

Renee Johnson, Julia Dilley, Johannes Thrul, Kayla N. Tormohlen, Kristin E. Schneider, Ming Ma, Arnold Levinson, Ashley Brooks-Russell
Johns Hopkins University, Oregon Health Authority, University of Colorado Denver

Medical Marijuana Laws Are Associated with Screening and Discussing Marijuana Use with Health Care Providers: Findings Among Adolescents and Young Adults In 2015-2017

Pia Mauro, Melanie Askari, Silvia Martins
Columbia University

Discussant: Jan Copeland
University of New South Wales

Symposium: Concurrent and Simultaneous Use of Marijuana and Other Drugs: Current Research on Patterns of Use and Associated Consequences

Chair: Adrian J. Bravo
University of New Mexico

Concurrent polysubstance use can be defined as the use of two or more substances within a given time period (e.g., over the past month or year) and can lead to dramatic health consequences due to the additive or interactive psychosocial or health effects of combining substances. Within the present symposium, we feature four presentations examining diverse research questions on the initiation and consequences of concurrent use (including simultaneous use) of marijuana and other drugs (e.g., alcohol, tobacco, cocaine) across various populations and methodologies. First, using population-based data, Dr. Cohn will present on findings on the relative proportion and correlates of youth and young adults who report trying alcohol vs tobacco vs marijuana first, and

whether trying marijuana first (vs alcohol or tobacco first) increases risk for poly-substance use. Second, using population-based data, Dr. Lopez-Quintero will present data exploring the patterns and outcomes (including past-year substance use disorders) of drug co-use among subgroups of marijuana users (i.e., medical-only users, recreational-only users, or combined medical and recreational users). Third, Mr. Voss will present on findings examining correlates and potential functional impairment associated with alcohol and cannabis co-use in a diverse sample of young adult heavy drinkers. Fourth, Dr. Fairlie, will present on findings using ecological momentary assessment to examine day-to-day fluctuations in motives for using alcohol and/or marijuana among young adult substance users, and the extent to which motives predict the likelihood of simultaneous use. Finally, Dr. Bravo will discuss the clinical and research implications from these studies.

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Sequencing of Onset of Alcohol, Tobacco, and Marijuana Use and Implications for Single and Poly-substance Use in Youth and Young Adults

Amy M. Cohn, Amanda L. Johnson
University of Oklahoma

Background: More than half of US states allow for recreational, medical, or decriminalized use of cannabis. Concerns have been raised that increased availability and/or exposure to marijuana could lead to greater curiosity to use and lower age of onset for marijuana, as well as be a "gateway" drug to other substances, like alcohol or tobacco. To address these concerns, this study used population-based data to examine the relative proportion of youth and young adults (YAs; ages 18-24) who reported ever trying alcohol vs tobacco vs marijuana first; as well as the mean age of onset for each product across those who ever tried one, two, or three of these products. Analyses also examined the extent to which trying marijuana first (vs alcohol or tobacco first) increases risk for poly-substance use. Method: Data were from youth (n = 5,904) and YAs (n = 8,339) in Wave 1 of the Population Assessment of Tobacco and Health (PATH) study (2013-2014)

who reported ever using alcohol, marijuana, and/or tobacco. Results: The majority of youth had tried only a single substance (56.9%), while almost half of YAs had tried all three substance categories (44.6%), followed by two categories (28.7%), and then a single category (26.6%). Among each trier subgroup, the majority of respondents reported trying alcohol first or trying alcohol with either tobacco or marijuana first. In both youth and YAs, trial of tobacco alone or with other substances was the second most common product that was tried first. In each trier group, the proportion of respondents who tried marijuana first (alone or with alcohol or tobacco) was lower than the proportion of respondents who had ever tried alcohol or tobacco first. Among youth, the average age of trial for marijuana did not differ significantly across the trier subgroups (p =.102), but did for YAs (p = .002). Specifically, the average age of onset for marijuana trial was significantly lower for YAs who had tried two (M = 16.7) or three substance categories (M = 16.2) vs one substance category (Mage = 17.2). Finally, in multivariable models that adjusted for demographics and mental health variables, trying marijuana first (vs alcohol or tobacco first) was associated with increased the odds of past 30-day poly-substance use vs single substance use (AOR = 1.43; 95% CI:1.20, 1.71). Conclusions: Recent population-based data suggest that marijuana trial is not more popular than trial with either alcohol or tobacco. However, among those who do use marijuana first, the odds of engaging in poly-substance use are increased by 43%, even after controlling for a variety of factors that could be correlated with marijuana and substance use behavior. This latter finding suggests that prevention efforts focused on deterring initiation of marijuana could have secondary public health benefits by reducing other substance use behavior.

Patterns of Drug Co-use and Drug Use Outcomes Among Medical and/or Recreational Marijuana Users

Catalina Lopez-Quintero
University of Florida

Aim: Cannabis-only users have an exceptionally low risk of becoming drug dependent (<2%), in contrast with the risk of those who use cannabis

with other drugs (>16%). While the number of medical marijuana users is growing, little is known about the patterns and consequences of drug co-use in this population. This information is essential to reduce potential negative consequences associated with medical marijuana use, particularly when marijuana is recommended within a clinical encounter. This study aims to fill this knowledge gap by assessing the patterns and outcomes of drug co-use among subgroups of marijuana users (i.e., medical-only users, recreational-only users, or combined medical and recreational users). Methods: Data was derived from the 2015-2017 National Survey on Drug Use and Health (NSDUH) involving a sample of 25,689 adults (18+ years old), who used marijuana in the past year. Mean number of days of tobacco use, binge drinking, cocaine use, and analgesic, stimulants or tranquilizers misuse in the past-month and the prevalence of past-year use disorders occurrence were estimated across subgroups of marijuana users. Multiple negative binomial and multivariable logistic regression models examined the association between marijuana use subgroup and days of use in the past-month and drug use disorder occurrence. Analysis weights with Taylor series linearization were applied to accommodate for the complex sampling design. Results: Rates of past-year cannabis use disorder (CUD) were higher among combined medical and recreational marijuana users (16.1%) than among medical-only (9.9%) or recreational-only (9.4%) marijuana users (p<0.01). Among any medical marijuana users, any additional drug co-used increased the likelihood of CUD occurrence by almost 70% (aOR: 1.7; 95% C.I.: 1.4;1.9). Compared to medical-only marijuana users, combined medical and recreational marijuana users reported more days of tobacco use (IRR: 1.4; 95% C.I.: 1.2, 1.6), binge drinking (IRR: 1.4; 95% C.I.: 1.1, 1.7), cocaine use (IRR: 3.3; 95% C.I.: 1.5, 7.1) and prescription pain reliever misuse (IRR: 2.7; 95% C.I.: 1.5, 5.0). Relative to medical-only users, combined medical and recreational users were more likely to report past-year nicotine dependence (aOR: 1.8; 95% C.I.: 1.3;2.4), a past-year cocaine use disorder (aOR: 2.6; 95% C.I.: 1.2;5.3), and a past-year prescription pain reliever use disorder (aOR: 2.5; 95% C.I.: 1.4;4.6). Conclusions: After accounting for important potential confounders, such as age or health status, those who used marijuana for both medical and recreational reasons showed higher levels of drug co-use and drug use disorders occurrence, including CUD, than medical-only users. Among medical users, the number of drugs co-used was positively associated with CUD occurrence. Combined medical and recreational marijuana users also showed higher levels of tobacco use and nicotine dependence than recreational-only users. The findings underscore the need to incorporate drug use prevention interventions during clinical encounters where marijuana is recommended. Study results should be interpreted in light of misclassification, social-desirability and other bias. Future studies need to investigate in depth the factors associated with increased drug co-use and adverse outcomes among combined medical and recreational marijuana users.

Characteristics of Alcohol and Cannabis Co-Use in a Diverse Sample of Emerging Adult Heavy Drinkers

Andrew T. Voss, Ashley A. Dennhardt, James MacKillop, James G. Murphy
University of Memphis, McMaster University

Objective: Data from the most recent Monitoring the Future Study suggests that cannabis use among emerging adults is more common than in any other age group, while perceptions of the risks associated with cannabis among this group are at an all-time low. In addition, cannabis is the most common type of illicit drug used concurrently with alcohol, with some studies estimating co-use rates of 20-30% among young adult heavy drinkers. Despite the high prevalence of co-use, the literature on correlates and potential functional impairment associated with alcohol and cannabis co-use is mixed, with some studies finding worse alcohol-related (e.g., drinking and driving, alcohol use disorder), and other psychosocial (e.g., anxiety and depressive symptoms) outcomes among co-users, and others with null findings. Further, it is important to extend the existing literature by examining co-use and associated outcomes among diverse young adult populations, including African-Americans, and young adults who have not attended college. Considering the mixed results and low perceived risk of cannabis use, it is especially important to identify outcomes of co-use among young adult populations. The current

study seeks to replicate and extend the current literature on correlates of co-use in a diverse sample of young adult heavy drinkers. Method: Data were from a sample of young adults age 21-25 who endorsed past-month heavy drinking (N = 604). The majority of participants had some college experience (60%) with 56.7% identifying as female, 46.9% who identified as White and 41.6% who identified as Black or African-American. Participants reported consuming on average 17.4 (SD = 15.2) drinks per week; 33.3% reported using cannabis at least once in the past month, and 20.2% reported daily use of cannabis. Results: Participants without college experience were almost twice as likely to endorse co-use as their college peers and a greater percentage of co-users were unemployed (25%), compared to alcohol-only users (18%). Participants who identified as Black, endorsed co-use at higher rates (27%) than any other racial group. Pertaining to alcohol-related outcomes, 32% of daily co-users reported at least one recent alcohol-induced blackout, compared to only 21% of alcohol-only users. After controlling for college status and employment, daily cannabis use was associated with greater depressive and anxiety symptoms, a greater number of environmental suppressors of reward, more alcohol use disorder symptoms, less perceived risk of drinking after driving (DD), and greater number of DD episodes. However, these associations varied significantly across racial groups. Namely, environmental suppressors of reward was highly associated with co-use among African-American participants, while other variables were non-significant. Conclusions: The current results suggest that daily use of cannabis among heavy drinking young adults is associated with unique risk for specific severe alcohol-related consequences including alcohol-induced blackouts, and drinking and driving. Further, findings suggest a novel correlate of co-use (i.e., environmental suppression of reward) that could shed light on the higher rates of anxiety and depressive symptoms among this group. Finally, the current study contributes to the literature by identifying important differences in incremental functional impairment of co-use across racial groups.

Daily Motives for Alcohol and Marijuana Use as Predictors of Simultaneous Use Among Young Adults

Anne M. Fairlie, Megan E. Patrick, Jennifer M. Cadigan, Devon Alisa Abdallah, Mary E. Larimer, Christine M. Lee
University of Washington, University of Minnesota

Objective. Most research has examined motives for alcohol or for marijuana separately, although young adults may be using either substance separately or both substances together for similar reasons. Simultaneous alcohol and marijuana (SAM) use, "using alcohol and marijuana at the same time so that their effects overlap," is common among young adults. In order to understand when SAM use is most likely to occur, it is important to understand reasons across substances, including the motivational context in which young adults choose to use alcohol and/or marijuana. This study examines day-to-day fluctuations in motives for using alcohol and/or marijuana among young adult substance users. Aims were to determine: (1) the extent to which coping, enhancement, social, and conformity motives predict heavy episodic drinking (HED; 4+/5+ for women/men), alcohol use, and marijuana use on days young adults used either alcohol and/or marijuana, (2) the extent to which motives predict SAM use on days young adults used alcohol, and (2) the extent to which motives predict SAM use on days young adults used marijuana. Method. Data were from a community sample of young adults who were 18-25 years old, reported SAM use 1+ times in past month, reported drinking alcohol 3+ in past month (analytic sample: N=399, mean age=21.63 [SD=2.17]; 50.9% women). Participants reported alcohol use, marijuana use, SAM use, and also coping, enhancement, social, and conformity motives "for alcohol and/or marijuana use" for 14 consecutive days. Multilevel models (MLMs) were estimated to test the extent to which motives for alcohol and/or marijuana use were associated with alcohol, marijuana, and SAM use. HED and SAM use were each modeled with a logit function, while number of drinks and hours high were each modeled using a Poisson distribution. Results. Across the 14 days, most participants reported alcohol use (95.4%; 1,917 days) and also marijuana use (81.70%; 2,166 days). SAM use (599 days) was reported by 21.30% of participants on one day, 15.04% on two days, 21.05% on 3-11

days, and the remaining 42.61% on zero days. Multilevel models showed that motives on a given day were associated with substance use that day. Elevated enhancement motives on a given day were associated with HED, drinking more, and more hours high from marijuana. Elevated social motives were associated with engaging in HED and drinking more and also with fewer hours high. Elevated conformity motives were associated with drinking more. SAM use was more likely on alcohol days and on marijuana days with elevated enhancement and conformity motives. SAM use was also more likely on alcohol days with elevated coping motives and on marijuana days with elevated social motives. Conclusions. SAM use on a given day was primarily associated with enhancement and conformity motives. Social motives were more strongly linked to alcohol use, and to some extent coping motives were linked to marijuana use in this sample of young adult users. Further examination of situation-specific motives and contexts of use is needed to inform development of real-time interventions for SAM use and consequences.

Discussant: Adrian J. Bravo
University of New Mexico

Symposium: Customers, Retail Staff and "Stoners": Young Adults' New Roles and Identities in a Legal Marijuana State

Chair: Beatriz Carlini
University of Washington

Before 2012, adult marijuana consumers in WA State relied on a black/gray market to sustain their use, and risked incarceration when engaging in commercial transactions to acquire or sell cannabis. Since legalization, young adult consumers have come "out of the shadows" and can now openly engage in the marijuana market landscape as consumers and cannabis industry professionals. They also have the opportunity to discuss their identity, practices and perspectives as marijuana consumers more openly, creating a window of opportunity for research. This symposium will present studies conducted by three University of Washington researchers, bringing a diverse perspective of how young adults navigate the legal marijuana landscape in Washington. Implications of these findings for prevention and treatment will be discussed.

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Marijuana Customers: Product Preferences Amongst Different Types of Young Adult Consumers

Devon Alisa Abdallah, Christine M. Lee, Rose Lyles-Riebli, Megan Patrick
University of Washington, University of Minnesota

Purpose: Marijuana is the most commonly used psychoactive substance, after alcohol, amongst young adults, with 53% reporting lifetime use and 22% past month use (NIDA, 2018). Despite popularity and increasing legalization, important knowledge gaps exist, such as why marijuana users prefer certain modes of use and what characteristics they look for when choosing products. The present study examines differences between self-identified light, moderate, and heavy marijuana users in terms of 1) preferred mode of use (e.g., smoking, eating, drinking, vaping, and other), 2) why they prefer a given mode, and 3) to what extent they pay attention to certain properties when choosing marijuana (e.g., THC content, cost, strain). Answers to these questions will inform development of targeted messaging. Method: Participants included a subsample of young adults who self-identified as marijuana users (N=218; 54.6% female, M age=21.88, SD=1.78) who were part of a larger study on health behaviors in Washington State. Participants completed measures about their marijuana use, preferred mode of use, and reasons for mode preference. Participants indicated the extent to which they pay attention to THC content, strain, quality of marijuana, and cost when choosing marijuana (from 0=not at all to 4=very much). Data analyses included one-way ANOVAs to compare three types of self-described marijuana users (i.e., light users [n=108, 49.5%], moderate users [n=71, 32.6%], and heavy users [n=39, 17.9%]) on their marijuana use, modes of use, and preferences when choosing marijuana. Open-ended responses on the reasons for mode preference were coded for themes, including better or different high (than other modes),

convenient or easy to use, and healthier than smoking marijuana. Results: In the past 30 days, 90.4% of participants reported marijuana use. Overall, heavy marijuana users reported being high from marijuana more hours in a typical week (M=31.38, SD=20.73) than either moderate or light users, with moderate users (M=16.18, SD=10.95) reporting being high more hours than light users (M=3.38, SD=5.61). When participants were asked their preferred mode of use, light marijuana users were more likely to prefer edibles, while heavy users are more likely to prefer "other" (e.g., dabs) modes. Qualitative analyses revealed the majority of participants who preferred edibles (n=34) or vaping (n=39) used these modes because they believed they were healthier than smoking. Participants (n=109) who preferred smoking cited their top reason as convenience. Regarding attention paid to other characteristics, light users paid significantly less attention to THC content, strain, quality, or cost when choosing marijuana (ps<.001). Conclusions: Taking into consideration changing marijuana policies, understanding the decision making processes among different user types is critical for public health messaging. For example, participants in this sample who cited vaping as their preferred mode reported choosing this method because it was "healthier than smoking marijuana", but may be unfamiliar with the risks associated with vaping. Similarly, different types of marijuana users may warrant different messaging. For example, light marijuana users are more likely to use edibles and less likely to pay attention to THC content, which may put them at greater risk for overdose.

Cannabis Retail workers: Exploring the Potential of Budtenders as Harm Reduction Agents

Beatriz H. Carlini, Caislin Firth, Sharon Garrett, Robin Harwick
University of Washington

We will present the results of a just concluded project exploring the potential for cannabis retail staff (budtenders) to educate their customers on practical strategies aimed at reducing negative consequences associated with cannabis use. A harm reduction framework and qualitative methods was utilized. Participants who report working in Washington (WA) cannabis retail stores for at least six months and interacting directly with the public were recruited for four focus groups. A total of 18 participants, median age of 27 years, fourteen women and four men, shared their perspectives about their professional role in, experiences with and motivations for conveying information to customers on minimizing risks associated with cannabis use. Group discussions were recorded and transcribed verbatim for analysis. Topics explored included budtenders' perspectives on issues of public health significance such as cannabis dosing and potency, cannabis use during pregnancy, acute cannabis intoxication, driving under the influence, cannabis storage and second hand exposure. Results are under analysis and will be presented in the symposium. Results will be used to inform recommendations for developing training resources for this growing and important segment of the cannabis industry workforce.

Marijuana Identities: Developing and Examining Implicit Association Tests That Measure Associations Between Marijuana and The Self Among WA State Young Adults

Jason J. Ramirez, Christine M. Lee, Kristen P. Lindgren
University of Washington

Introduction/Objective: It has now been over six years since the approval of I-502 to legalize recreational marijuana use in Washington state. Considering this timeframe, many young adults' experiences with marijuana in WA have taken place in a social climate that is vastly different compared to older generations' social climates. As more states seek to legalize recreational use, it is becoming increasingly important to understand how younger generations think about marijuana and how they conceptualize their own identities in relation to marijuana use in this social climate. This presentation will discuss qualitative and quantitative findings from a project that developed Marijuana Identity Implicit Association Tests (MI-IATs), which are computerized measures that aim to assess the strength of associations between marijuana and one's identity among young adults (ages 18-25). Methods: The current project included 150 young adults (18-25 years old, 48.2% female) recruited from Washington State who reported using

marijuana at least once per week in the past month. Twenty-two participants in the sample participated in focus groups to discuss perceptions of marijuana identification and to inform the development of MI-IATs. The remaining 128 participants completed an online assessment that included self-report measures of marijuana use and related consequences and two versions of MI-IATs; one of which used words to represent marijuana, the other used images to represent marijuana. A two-week follow-up assessment, to assess test-retest reliabilities of the MI-IATs, was also completed by 65 of the participants. Results: Young adults in focus groups noted that increased identification with marijuana could occur via several mechanisms including 1) increased frequency and quantity of use, 2) involvement in a marijuana-using peer group, 3) engaging in specific modes of use, and 4) selling and/or growing marijuana. Based on feedback from focus groups, two MI-IATs were developed. The image-based MI-IAT had test-retest reliability of $r = 0.37$ and split-half internal consistency of $r = 0.62$, whereas the word-based MI-IAT had test-retest reliability of $r = 0.45$ and split-half internal consistency of $r = 0.40$. Regression models that controlled for age and sex found significant, positive associations between word-based MI-IAT scores and typical hours high per week in the past month ($B = 0.56$, $p = .03$) and marijuana-related consequences ($B = 13.16$, $p = .01$), whereas image-based MI-IAT scores were not significantly associated with hours high or consequences ($ps > .05$). Conclusions: Overall, results provide partial support for associations between marijuana and identity as risk factors for marijuana misuse. However, only scores on the word-based MI-IAT were uniquely associated with young adults' marijuana use and related consequences. One possible explanation for the findings is that young adults' identities may be largely social constructs during this period of development. To this end, some of the stimuli in the word-based MI-IAT were thought to represent social groups (e.g., the words "stoner, user"), whereas stimuli in the image-based MI-IAT were limited to images of marijuana and related paraphernalia itself which may be less tied to one's social identity.

Discussant: Susan Stoner
University of Washington

Symposium: Marijuana Use among Older Adolescents and Young Adults: Measurement, Rates, and Types of Use among Diverse Groups in the United States and Abroad

Chair: Eric Pedersen
RAND Corporation

Older adolescents and young adults continue to be important groups to examine in marijuana studies given their higher rates of use compared to other age groups. Using large and diverse samples of adolescents and young adults, we present a series of talks increasing in global diversity, beginning with college students from one state and ending with college students from five different countries. First, we present on college student marijuana use in Colorado, a state where marijuana is legal for sale and possession, and describe a novel method for collecting detailed information regarding frequency and quantity of marijuana use across a variety of different products, potencies, and doses. Next, we present data from a large national epidemiological study on use among American Indians living on or near reservations, which is a population at risk for heavy and problematic substance use, but for which little is known about risk factors. Third, we present data from a large scale study of American college students studying abroad in foreign countries. We present prevalence rates of use abroad by gender and by country, and describe risk factors for heavier use abroad. Lastly, we present data from a large multinational study of college students in the United States, Argentina, Spain, Uruguay, and the Netherlands. Findings presented will describe high rates of use across countries with multiple cross-national differences on consumption patterns and contexts of use. Overall, our findings have important implications for assessment, prevention, and treatment of heavy marijuana use among young adults in the United States and abroad.

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A Modified Timeline Followback For Marijuana: A Simple Comprehensive Marijuana Use Assessment

Mark A. Prince

Colorado State University

Marijuana use is best described across four domains: quantity consumed, frequency consumed, potency of the product (i.e., the amount of psychoactive compounds per unit), and route of administration. However, the majority of studies rely on marijuana use frequency alone. The reliance on marijuana use frequency is in part due to the ease of collecting frequency data using established self-report measures. While easy to collect, frequency data alone does not allow for rank ordering of participants based on the amount of psychoactive compounds consumed. Further, there is a growing literature on the heterogeneity in pharmacokinetics of marijuana across routes of administration. Thus, two people consuming the same quantity and potency of marijuana products using different routes of administration may experience different effects. There is a need for an easy to use comprehensive marijuana assessment that will collect adequate information to achieve the goal of establishing links between marijuana use and a variety of outcomes. The present study combined a number of often used substance use assessments (e.g., the Timeline Followback, the modified daily drinking questionnaire broken into 4-hour blocks) with knowledge about the nuances of marijuana use. The final assessment tool allows participants to report quantity, potency, and route of administration information in each 4-hour block across the past two weeks (though it could easily be extended to longer time frames). Frequency data is gathered by aggregating across blocks and days. The range of possible variables that can be calculated from this assessment tool is immense. Some examples include: percent time using marijuana flower, concentrate, edibles, or topicals; typical potency of products across a range of routes of administration; typical quantity consumed; maximum quantity consumed; typical marijuana dose (i.e., quantity X potency); percent days abstinent, and so on. Each of these metrics may have differential predictive power for a host of outcomes. The present study reports on pilot data from 512 marijuana using college students (72% female) in a state with legal recreational marijuana. Dr. Prince examined a range of marijuana use indicators' associations with marijuana use consequences. Participants reported selecting concentrated marijuana products that contained on average twice the potency of THC compared to the potency of marijuana flower products; however, on average they reported similar levels of CBD levels across flower and concentrated marijuana products. Spearman's correlations were calculated due to the non-normality of most indices of marijuana use and of the marijuana problems total score. Correlations ranged from trivial to large, with the largest associations between marijuana use and consequences coming from the following indices: percent time using marijuana flower, percent days abstinent, maximum quantity of concentrated marijuana, and concentrated marijuana dose of THC and CBD (as separate variables). This measure is easy to use, quick to administer, and has the quality of providing data towards a range of indices that can capture the nuances of marijuana use.

Marijuana Use Patterns Among American Indian Youth

Olivia Bolts, Mark A. Prince, Linda Stanley, Randall Swaim
Colorado State University

American Indian (AI) youth are more likely to endorse past 30-day marijuana use compared with non-AI youth who attend the same schools located on or near reservations. However, there is limited research describing marijuana use patterns among AI youth. An increased understanding of marijuana use patterns and behaviors of AI youth can help inform prevention efforts for AI youth. The present study is a large epidemiological study of 7th-12th grade self-identified AI students who reside in different regions of the United States (i.e., North East, North West, Northern Plains, South East, South West, Upper Great Lakes). AI youth in the Upper Great Lakes region report the highest frequency of marijuana use, while AI youth in the North East region report the lowest frequency of use. Across all regions, risk factors for increased marijuana use include common reasons for using (i.e., to feel good or get high, to find deeper insights and understanding, to get through the day, because I have to have it). In addition, feeling discriminated against because of race or ethnicity appears as a prominent risk factor among all regions excluding the South East. Also, greater perceived risk of harm from using marijuana

regularly serves as a protective factor associated with less use among AI youth in all regions. Moreover, an increased importance of religion in one's life and attendance of religious services function as protective factors for AI youth in the Northern Plains, South East, and South West regions. Excluding the North East region, attitudes toward school (e.g., enjoyment of school, endorsement of greater likelihood for attending college) are associated with less marijuana use, as well. Risk and protective factors related to identifying with AI culture vary across regions. Among AI youth in the North East, endorsement of future success in the White-American culture appears as a specific risk factor for increased marijuana use. For AI youth in the North West, following another way of life different from AI and White-American culture may serve as a risk factor for greater use. AI youth from the South West and Upper Great Lakes regions might be at heightened risk for increased marijuana use if their family follows AI culture and they intend to incorporate AI culture as an adult, whereas these characteristics might function as protective factors against greater use for AI youth in the Northern Plains region. Lastly, protective factors for AI youth in the South East include living in line with White-American or non-AI culture. Overall, risk and protective factors observed across distinctive regions of AI youth provide a glimpse into the potential differences of marijuana use patterns among AI youth, and thus suggest the importance of continuing to identify within-group differences and considering such differences when implementing interventions on AI reservations.

College Student Marijuana Use During Study Abroad Experiences

Eric R. Pedersen, Sarika Bharil, David Klein, Elizabeth D'Amico, Beth Ann Griffin
RAND Corporation

College students who are completing study abroad experiences have recently been identified as a group at-risk for increased heavy drinking, with levels of alcohol use more than doubling during the one to three-month time periods while students are abroad. However, very little is known about the drug use of American college students abroad. As part of a larger study examining the

drinking behaviors of college students abroad, we assessed marijuana use among 2,245 American college students (mean age = 20, 77% women, 69% white) completing study abroad programs in 12 different countries in Europe, Australia, Asia, Latin America, and Africa. Marijuana use was assessed by a single item for frequency via online self-report surveys regarding the month immediately prior to the trip, during the first month of the trip, and during the last month of the trip. During each time point, participants also indicated their perceptions of the marijuana use of their country-specific study abroad peers. Among the entire sample, 24% reported marijuana use in the month prior to the study abroad trip, with 19% reporting use in the first month of their trip and 23% reporting use during the last month of their trip. At all timepoints, men were significantly more likely to report marijuana use than women. Students in specific countries (e.g., Germany, Costa Rica, South Africa, Spain) reported higher rates of use abroad than students in other countries (e.g., China, Japan, Mexico). Participants perceived that other students in their host country were using marijuana abroad at rates much higher than actual: they believed that 72% and 69% of their peers were using marijuana during their first and last months abroad, respectively. In addition, participants believed that local people in their host countries were using at higher rates than estimated as actual in each country, with participants believing that 66% and 64% of local people were using marijuana during their first and last months abroad, respectively. These findings demonstrated that about 1 in 5 college students abroad report marijuana use during their trip, with differences in rates of use by gender and by host country. As perceptions of prevalence of use by other study abroad students and by local people were drastically overestimated, it may be important to develop programs that correct normative misperceptions of marijuana use abroad, particularly for students studying in countries where recreational marijuana is illegal, in an effort to prevent students from experiencing negative consequences from drug use during the trip.

Examining Marijuana Use Prevalence and Context of Use in Five Countries: Findings from the Cross-cultural Marijuana Study

Adrian J. Bravo, Cross-Cultural Addictions
Study Team
University of New Mexico

Marijuana (or cannabis) is the most widely used illicit drug in the world. Rates of marijuana use and cannabis use disorder peak in young adulthood and among young adults, college students are at a significantly higher risk for marijuana use initiation compared to same-aged individuals not enrolled in college. Globally, marijuana use among college students is prevalent and heavy marijuana use is associated with increased negative consequences. Despite the high prevalence of marijuana use in college students around the world, alongside recent increments in the medicalization and legalization of marijuana use, there is a paucity of cross-cultural studies fully examining differences in patterns of use across countries with different cultural backgrounds and marijuana policies. In this presentation, Dr. Bravo will present on work examining prevalence, patterns (i.e., product use, consumption location, and consumption context), and cross-national differences of marijuana use among college students (total sample: n=3,482, 68.1% females) from five countries (U.S.: n=1,918, 67.3% females; Argentina: n=375, 66.7% females; Spain: n=754, 66.4% females; Uruguay: n=133, 80.5% females; and Netherlands: n=302, 70.4% females). Cross-tab calculations were conducted to examine differences across countries on proportion of students that reported lifetime and last 30-day use (significant differences were determined by using a Z-test with a Bonferroni correction). Significant mean differences on continuous marijuana use variables were determined via post-hoc comparisons using a Bonferroni correction within an ANOVA framework. Among all marijuana users, students consumed marijuana on about 10 days in the past 30 days (M=9.80), reported using about 6 grams of marijuana (M=6.12) across 6-7 time periods during a typical week (M=6.10). On a 0 (not at all) to 100 (completely) scale, participants reported typical subjective intoxication to be above the midpoint (M=55.36) and reported being intoxicated for a 3 hours on a typical use day (M=3.00). For consumption patterns, most students reported consuming "plant" as their primary product (77.11%). For location, the majority of participants consumed marijuana either a home or a friend's home (63.82%). For context, most participants consumed marijuana with friends (76.07%). There was a plethora of cross-national differences on consumption patterns, location of use, and context of use that will be discussed in the presentation. Our findings supported marijuana use as a highly prevalent behavior in college students from different countries/cultures, particularly in Uruguay, a South-American country that recently endorsed the legalization of marijuana production, possession and use (all these regulated by the federal government). Moreover, cross-national analyses revealed distinct routes of ingestion, context of use, and type of products used among college student marijuana users from 5 countries. These distinct patterns in use of marijuana across European and American countries have particular implications for prevention and treatment.

Symposium: Methodological Challenges in Cannabis Research

Chair: Robert Cook
University of Florida

As state policies have begun to change and cannabis products have become more readily available to consumers, the opportunities to research health harms and benefits of cannabis have also increased. Despite an increase in research opportunities, cannabis research still faces significant barriers and challenges. As cannabis itself is a complex substance that cannot be reduced into a single pharmacological agent it poses significant methodological challenges. This symposium will examine and discuss methodological challenges in cannabis research specifically in recruitment, measurement of marijuana use, and issues determining the efficacy of marijuana for a therapeutic use. The first presentation will examine the barriers to recruiting hard-to-reach, hidden, or vulnerable populations in cannabis studies. The second presentation will discuss challenges and strengths of using the Marijuana Timeline Follow Back measurement in a multi-site research setting. The third presentation will explore the feasibility of using an ecological momentary assessment to determine real-time medical

marijuana use among older adults with chronic pain. The final presentation will examine results from a scoping review to show common methodological challenges among medical marijuana efficacy studies.

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Recruitment and Retention of Hard-to-reach, Hidden and Vulnerable Populations in Cannabis Research

Shantrel Canidate
University of Florida

Objective. Despite regulatory efforts set forth by the National Institute of Health (NIH) to increase the representation of women and minorities in clinical research, recruitment and retention of these groups including hard-to-reach, hidden, or vulnerable populations in clinical research is relatively low. Factors influencing low participation among these groups include the social or physical location of the group, vulnerability, as well as the hidden nature of the group. With regard to cannabis research, researchers have been unsuccessful in recruiting and retaining non-injecting drug users as well as recreational drug users in clinical research. Though cannabis use is highly common in many western countries and its prevalence rate exceed that of many illicit drugs. This presentation attempts to discuss the importance of recruiting and retaining hard-to-reach, hidden, or vulnerable populations in clinical research specifically, cannabis research. As well as factors contributing to barriers and challenges, as well as solutions to overcome these challenges. Methods. The Marijuana and Potential Long-term Effects (MAPLE) study seeks to explore the influence of marijuana on key health outcomes and behaviors among persons living with HIV (PLWH). To date, the study has recruited 79 individuals from various settings (i.e., public health clinics, patient registries, and patient referrals from the community) with the goal of 480 study participants. Findings. While determining the most effective recruitment strategy takes significant planning and execution, working around the unforeseen factors which may negatively impact recruitment is imperative.

Moreover, challenges associated with hard-to-reach, hidden, as well as vulnerable population are primarily contingent upon two factors: individual barriers to study participation (i.e. labeling the population, mistrust of researchers, risks associated with participating in clinical research, lack of resources) and sampling issues (i.e. snowball and respondent-driven sampling and derived rapport). Among the hard-to-reach, hidden, and vulnerable populations such as cannabis users, studies examining barriers and challenges to recruitment and retention among these populations reported solutions which include developing a well-thought out study design which includes multiple sampling strategies, expanding eligibility criteria, disseminating study findings to garner to dispel mistrust, as well as building rapport with potential participants and key community members.

Strengths and Challenges of Using the Marijuana Timeline Follow Back for a Multi-site Research Setting

Verlin Joseph, Paige Rickett, Robert Cook
University of Florida, Florida Department of Health

Objective. As attitudes and policies regarding marijuana use continue to shift, developing self-reported measurement tools have become a leading concern in the field. In clinical and research settings, the gold-standard of self-reported substance use is The TimeLine Follow-Back (TLFB). Previously, the TLFB has been shown to be both valid and reliable for measuring alcohol, marijuana, and illicit drug use. Traditionally, marijuana is more difficult to quantify due to having several routes of administration when smoking (i.e. joints, blunts, pipes, bongs, and vaporizers) and unique dosing per individual. Further complicating self-reported marijuana is recall bias. In order to overcome these limitations, we have adapted the alcohol timeline TLFB in order to develop a common metric of cannabis use. The primary goal of the marijuana TLFB is develop a standardized unit of measurement to compare marijuana use across mode of administration, quantity/frequency of use, and THC/CBD concentration. Here, we discuss the strengths and challenges of using the

TLFB to measure marijuana use. Methods. In order to overcome these challenges, we have adapted the TLFB for alcohol use to address these limitations. Our TLFB instructs participants to recall the past 30 days of marijuana use. We are especially interested in mode of administration, number of grams, and number of hits. To date, we have recorded (N= 70) responses, there were slightly more women than men (50.8% vs 47.5%). Most participants were non-Hispanic Black (75.4%) compared to non-Hispanic White (16.4%) and other (8.2%). Findings. Strengths of TLFB include: identifying distinct patterns of marijuana use, capturing detailed use across varying modes of administration, and time efficiency. Overall, participants enjoy this section as it offers a change of pace from longer study visits and they enjoy talking about their marijuana use. Challenges of TLFB include: recall bias as many participants, do not know the amount they are using, developing a standardized score to successfully describe the quantity/frequency of marijuana use. Additionally, several participants do not have a distinct pattern of use do to only using when it is available. Lastly, several participants struggle to remember the precise number of hits which may introduce bias when creating a standardized use score.

Measuring Medical Marijuana Use in Older Adults: Feasibility and Preliminary Findings From a Study Using Ecological Momentary Assessment (EMA)

Yan Wang, Robert Cook
University of Florida

Objective. Older adults, a population with high chronic pain burden, have become the fastest growing group of medical marijuana consumers in the context of the opioid crisis. There is an urgent need to investigate whether medical marijuana can help people reduce/quit opioids and improve pain management. However, it's challenging to accurately measure medical marijuana use given the widely varied products (e.g., different THC:CBD ratios and routes of administration) available at different dispensaries and the fact that people are self-dosing with minimal monitoring. This pilot study aims to investigate the feasibility of using ecological momentary assessment (EMA) to determine real-time medical marijuana use and pain relief among older adults with chronic pain. Methods. Older adults with chronic pain seeking to start medical marijuana were recruited from two medical marijuana clinics in Florida. Using smartphone based EMA, participants (50+ years old) rated their momentary pain approximately 1-week pre and up to 3 weeks post initiation of medical marijuana treatment. Specifically, participants were asked to complete three random assessments on their medical marijuana treatment and outcomes (e.g., product composition, dosage, administration route, time since last dose, real-time pain level, side effects) and one daily assessment (e.g., past 24-hour medication and substance use, sleep quality) every day for up to 4 weeks. Participants were also asked to take pictures of the labels on their medical marijuana products for validation of their self-reported information. Findings. Data from the first 11 participants (mean age = 57.2, SD = 2.1) included a total of 640 random and 224 daily EMA assessments (ongoing data collection). Ten out of 11 participants successfully complied with EMA procedures, and all 10 participants reported EMA procedures as acceptable and easy to follow. Results showed a wide range of products have been used by these participants. Most of them were using at least two different products at the same time with 1 vape product and 1 sublingual drop being the most common pattern of use. The composition ranged from pure CBD to pure THC with a variety of combination ratios in between (e.g., 1:1, 20:1, 40:1, 60:1). Participants reported positive effects of medical marijuana included improving sleep and helping with withdrawal/side effects from opioids, and side effects included dry mouth, nausea, and feeling sedated/sleepy/depressed. These preliminary findings suggest that EMA is a feasible and valid method for collecting data on the complex patterns of medical marijuana use and also for investigating the real-time health and side effects of medical marijuana on older adults with chronic pain.

Methodological Limitations and Barriers When Measuring The Efficacy of Medical Marijuana

Nichole E. Stetten, Jamie Pomeranz, Michael Moorhouse, Ali Yurasek, Amy V. Blue
University of Florida

Objective. As states continue to legalize medical marijuana, it is crucial that we examine the empirical evidence of the safety and efficacy of cannabis for therapeutic purposes. A scoping review was conducted to examine the levels of evidence currently available on medical marijuana's efficacy in the treatment across a large range of disabilities. Results from the scoping reviewed mirrored that of the National Academy of Science report but noted how quantitative and qualitative studies contradict each other on marijuana's efficacy in treatment of specific disabilities. The purpose of this presentation is to expand further on the published results of the scoping review and highlight common methodological limitations and barriers among the studies examined. Methods. The search strategy was developed to represent the four broad categories of disability: (1) physical (e.g. mobility, neurologic, traumatic brain injury, musculoskeletal), (2) intellectual (e.g. mental, Down's syndrome, autism), (3) cognitive (e.g. learning, attention deficit disorder) and (4) psychiatric (e.g. anxiety, depression, bipolar, schizophrenia). The search was completed using the following online databases: PubMed, Proquest and EBSCO (Academic Search Premier, CINAHL, PsychINFO). Findings. The majority of studies examined did not report what type of marijuana was used, how marijuana was being delivered, and dosage levels. When studies did report the strain, dosage and delivery method, they were usually significantly different across studies making it difficult to compare results of efficacy across studies. These results highlight the methodological challenge of drug delivery and standardized dosing procedures in cannabis research. The stark contrast in quantitative and qualitative research on the effectiveness of medical marijuana highlight another methodological issue in how efficacy is reported in the treatment of specific disabilities. Another explanation is that quantitative and qualitative are measuring two different types of outcomes. Looking at the canonical framework in disability research, International Classification of Functioning, Disability and Health (ICF) Model, quantitative studies are measuring body function and structure, one of the three levels of functioning. Whereas qualitative studies are typically assessing the other two levels of functioning (i.e. activity and participation).

Discussant: Robert Cook
University of Florida

Symposium: Risk, Resilience, Reasons, and Reduction: Factors Related to Marijuana Outcomes

Chair: Kirstyn N. Smith-LeCavalier
Colorado State University

The present symposium explores multiply determined marijuana-related outcomes (i.e., marijuana use and consequences) and elucidates factors that increase risk or protect against these outcomes. More specifically, four symposium talks will address the associations between childhood factors, psychological well-being and happiness, potency of the product being used, frequency of use, and a brief intervention have on marijuana-related outcomes. The first talk will discuss how an increase in experienced adverse childhood experiences predicts an increased likelihood of trying marijuana, and at a younger age, while childhood resiliency predicts the frequency at which one later uses. The second talk explores how varying levels of happiness and the six facets of psychological well-being are closely related to one's motives, specifically for individuals who use for coping and conformity motives. The third talk focuses on how both the frequency at which one uses cannabis and the potency of the cannabis being used influences the effect of motives on marijuana-related consequences. The fourth talk will describe the development of a single-session, harm reduction intervention designed to reduce marijuana-related problems. More specifically, this study assesses the differences in marijuana-related outcomes between two interventions using motivational interviewing and psychoeducation that differ in content. The four talks will provide greater understanding of how adverse childhood experiences, resiliency, happiness, psychological well-being, the types of products being used, and a harm-reduction intervention contribute to the experience of marijuana-related outcomes which may inform future prevention and intervention efforts.

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Childhood Factors Predict Later Marijuana Initiation and Use

Jamie Parnes, Bradley Conner
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Initiation of marijuana use in adolescence is known to predict greater short- and long-term negative consequences associated with use, including increased rates of dependence. Frequent marijuana use, particularly as an adolescent, may also lead to greater experienced harms from use. When examining distal factors that predict initiation of use, adverse childhood experiences are an influential component. Adverse childhood experiences have been previously linked to increased substance use, including marijuana use. Childhood resiliency, or the protective factors individuals have during their upbringing, serve to reduce rates of substance use initiation and use frequency. However, it has yet to be examined how adverse childhood experiences and childhood resiliency may interact to alter marijuana-related outcomes. Based on past literature, we hypothesized that increases in adverse childhood experiences would predict increased likelihood of marijuana initiation, earlier age of initiation, and increased frequency of use as a young adult We also hypothesized that childhood resiliency would moderate these relations, such that increased resiliency would mitigate the influence of adverse childhood experiences on marijuana outcomes. Participants ($N = 826$) were university students (M age 20.17, SD = 2.26; 55.7% female, 77.5% white, and 80.6% non-Hispanic). Participants completed several measures, including the Adverse Childhood Experiences Questionnaire (ACEs) and the Child and Youth Resilience Measure (CYRM). Measured marijuana-related behaviors included having ever used, age of initiation, and past 30-day use frequency. Moderation analyses were conducted in SPSS version 25.0, using ACEs, CYRM (mean centered), an interaction term (ACEs*CYRM), boostrapping to stabilize parameter estimates, and alpha set to .05. Binary logistic regression was used to examine the outcome of having ever used marijuana. As age of initiation approximated a normal distribution, linear regression was conducted to test this outcome. Finally, negative binomial regression was used to examine past 30-

day use frequency. Results indicated increases in reported ACEs related to an increased likelihood of endorsing having tried marijuana (b = .21, OR = 1.23, SE = .05, p <.01), however neither CYRM nor the interaction term were significant. Similarly, greater reported ACEs were related to a younger age of initiation (b = -.16, SE = .05, p < .01). However, neither CYRM nor the interaction term significantly predicted age of initiation. Finally, past 30-day use frequency was significantly predicted by CYRM (b = -0.3, IRR = 0.97, SE = 0.004, p < .001), however neither ACEs nor the interaction term were significant. While study hypotheses were not upheld, the results may still be meaningful. Combined, increases in experienced ACEs predicted increased likelihood of trying marijuana, and at a younger age, while childhood resiliency predicted the frequency at which one later uses. Therefore, interventions focused to reduce adverse childhood experiences may help reduce later marijuana use. As younger age of initiation predicts greater experienced negative consequences of use, interventions delaying initiation through reduced ACEs may also be effective harm reduction strategies. For adolescents already using, promoting resiliency factors may reduce frequency of use and related harms.

An Examination of the Influence of Happiness and Psychological Well-being on Marijuana Use Motives and Marijuana-related Consequences

Kirstyn N. Smith-LeCavalier, Theodore J. Fetterling, Mark A. Prince, Cross-cultural Addictions Study Team
Colorado State University

Marijuana use motives (MUM) are uniquely associated with marijuana use and marijuana-related consequences (MRC). Psychological Well-Being (PWB) has been characterized across six domains: autonomy, environmental mastery, personal growth, positive relationships with others, purpose in life, and self-acceptance. Happiness has been characterized across 17 subjective domains including housing, vocation/education, alcohol/drug use, etc. Some studies have examined PWB and happiness as outcomes of marijuana use and MRC. However, it is possible that PWB and happiness levels portend risk for marijuana use and consequences, and that

those with higher or lower levels of PWB and happiness will be motived to use for different reasons. The extant literature on PWB, happiness, and marijuana outcomes provides an inconsistent picture with some studies concluding that marijuana use and dependence are associated with lower general happiness and lower levels of PWB, and others finding no relation. Researchers have yet to examine whether varying levels of PWB and happiness are differentially associated with MUMs, which are, in turn, differentially associated with marijuana outcomes. We hypothesized that a sequential pathway from PWB and happiness to marijuana outcomes mediated by MUMs. The present study used data collected from college students in the US as a part of a multi-site international study (n = 698, 63.8% female). Path analysis was used to assess indirect effect from happiness through each of the five MUM to MRC, and the indirect effect from each of the six facets of PWB through each of the five MUM to MRC, controlling for past 30-day use. We used the product of coefficients method to determine significance of indirect effects. In assessing direct effects of happiness and PWB to MUMs, happiness and all six facets of PWB negatively predicted coping motives. All six facets of PWB also predicted conformity motives. In addition, social motives were negatively associated with three facets of PWB (i.e., autonomy, personal growth, purpose in life), and enhancement motives were positively associated with three facets of PWB (i.e., autonomy, personal growth, positive relationships with others). In assessing direct effects of MUMs on MRC, coping motives were positively associated with MRC in all models, and conformity motives were positively associated with MRC in three of the PWB models (i.e., personal growth, positive relationships, self-acceptance). Happiness was negatively associated with MRC. In assessing indirect effects, coping motives mediated the sequential path from happiness and all six facets of PWB to MRC. Additionally, conformity motives mediated the path from personal growth and positive relationships with others to MRC. Our findings suggest that happiness and the six facets of PWB are closely related to one's motives, specifically for individuals who use for coping and conformity motives. This suggests that PWB and happiness measures may be useful in screening and brief interventions to identify those at greater risk for using for maladaptive motives and subsequently for greater risk of negative marijuana-related outcomes. For example, tailoring prevention and intervention efforts towards those experiencing lower levels of happiness and PWB may mitigate the harms associated with use via coping and conformity motives.

Marijuana Use Motives Predict Marijuana-related Consequences Via Marijuana Use Frequency and Potency

Alexander J. Tyskiewicz, Shane D. Kentopp, Gemma Wallace, Bradley T. Conner, Mark A. Prince
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Marijuana use motives have been shown to have a unique effect on marijuana use and the likelihood of experiencing marijuana related consequences (MRC). Marijuana use frequency directly predicts MRC, as do marijuana use motives. However, it is unknown the extent to which marijuana potency influences these relations. Limited research has demonstrated that the use of marijuana concentrates predicts greater MRC than flower marijuana use. Based on past research, we hypothesize that marijuana use motives will have positive relations with MRC. Further, marijuana use frequency and product potency will moderate the effect of marijuana use motives on MRC. The current study is a secondary data analysis of research conducted as part of a larger study. Participants were recruited at marijuana dispensaries in Colorado. Researchers photographed the marijuana products that the participants bought in order to record the potency of the products. Participants then completed a survey online at their convenience in the next week. Participants completed the Marijuana Motives Measure, the Marijuana Consequences Questionnaire, and a survey intended to assess participants' marijuana product information and typical use patterns. As prior research has found there to be a large gap between the potency of flower and concentrates, the two types of products will be analyzed separately. The sample will be split into two groups based on the type of product participants purchased. Individuals who purchased flower will be assigned to one group and participants who purchased flower will be

assigned to the other. To test the study hypotheses, a series of 10 negative binomial regressions with interaction terms will be estimated in each group using MPlus Version 8.0 (Muthen & Muthen, 1998; 2012). Individual models will test the effect of one of the five marijuana use motives on MRC, moderated by use. Use will be operationalized as the potency of the product purchased multiplied by frequency of marijuana use, as this is a better assessment of THC intake than frequency or potency alone. Since multiple models will be run, an alpha of .01 will be used to correct for potential type 1 errors. Assuming study hypotheses are upheld, multiple conclusions can be made. First, the effect of motives on MRC is dependent on both the frequency at which one uses marijuana and the potency of the marijuana. People who use marijuana as a result of enhancement, conformity, expansion, coping, and social motives will report more consequences if they use marijuana frequently and use potent marijuana products. If the frequency of use and potency of the product are cumulatively high, motives will have a positive relation with MRC. If the frequency and potency concerning one's use are not cumulatively high, marijuana use motives will not predict more MRC.

Treating Marijuana-related Problems: A Brief Intervention

Theodore J. Fetterling, Mark A. Prince
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National survey data on drug use has shown that young adults (i.e., 19-30 years old) report consistently elevated levels of daily and past 30-day marijuana use. Higher rates of marijuana use have been linked with higher endorsement of negative marijuana-related outcomes. One approach designed to mitigate negative outcomes is through harm reduction (HR) interventions. Researchers have consistently demonstrated the effectiveness of HR approaches for the treatment of substance use. In fact, empirical evidence suggests that HR treatments are equally effective as the more common abstinence-based treatments. Despite these findings, HR remains relatively underutilized in marijuana treatment. The current study describes the development and evaluates the efficacy of a single-session, HR intervention designed to reduce marijuana-related problems. Participants will be randomly assigned to a Marijuana Specific Treatment (MST) experimental or Healthy Stress Management (HSM) control condition. Both conditions incorporate Motivational Interviewing (MI) style and psychoeducation but differ in content. The MST condition is composed of assessment feedback, a biopsychosocial model, decisional balance, and goal setting specific to marijuana use. Comparatively, the HSM condition provides general stress reduction techniques and coping strategies with no marijuana focus. We hypothesize that the MST condition will reduce significantly more marijuana-related problems than the HSM condition. The primary outcome of interest, marijuana-related problems, will be assessed using the Cannabis Problems Questionnaire (CPQ). An online survey including the CPQ will be administered via Qualtrics at baseline and approximately one-month post-treatment. This talk will focus on the development of the cannabis intervention based on previous studies shown to be effective in reducing cannabis related consequences (e.g., CANDIS), highlighting the modules selected and the rationale behind the selected components. In addition, preliminary analyses for the first few participants will compare treatment and control conditions for changes in CPQ scores, distress ratings for marijuana-related outcomes, and marijuana use. Additionally, we will discuss how a brief HR intervention can be used to facilitate treatment among problematic marijuana users.

Discussant: Mark A. Prince
Colorado State University

Symposium: The Future of Cannabis Research: Promising Directions from Early Career Investigators

Chair: Matthew R. Pearson
University of New Mexico

In the present context of legalization and medicalization of cannabis, applied cannabis research has reached an all-time high. The future of cannabis research will be greatly impacted by individuals who are presently choosing to focus their careers on cannabis. There are always

significant time lags between the generation of a research question, conducting the study to answer the research question, and the dissemination of such findings to the field. The goal of this symposium is to highlight the ongoing and future research efforts by early career investigators. Each early career presenter will provide brief talks about an ongoing or future study, focusing on the importance of their study to the field. We anticipate that most of these researchers will present findings from these projects in the next few years. After each individual talk, all presenters will be invited to discuss critical research questions to the field that cross specific disciplines and research interests.

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Social Weedia: Social Media Research on Cannabis Use

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As of February 2019, the total population of the world exceeded 7.7 billion people. Approximately 3.4 billion of those individuals are active social media users. Social media represents a potentially inexpensive and powerful tool for gaining insights into cannabis-related issues (e.g., impact of policies, emerging trends) in real time and with large population-level datasets of diverse cannabis users. This presentation will briefly cover how social media can be and has been leveraged to study recreational and medical cannabis use, as well as to deliver treatment interventions for individuals with cannabis use disorders. The presentation will also briefly cover opportunities for growth in social media research on cannabis and highlight future directions.

Acute Stress Modulation of the Cannabis Cue-elicited Late Positive Potential: A Biomarker of Cannabis Use Disorder Risk Among Emotionally Vulnerable Cannabis Users

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The prevalence of regular cannabis use and cannabis use disorder (CUD) has increased in the United States over the past two decades, but the majority of regular users do not develop CUD. However, given the high disability associated with CUD, it is imperative that regular users at highest risk for severe and persistent CUD are identified for the purposes of early identification and targeted intervention. Co-occurring internalizing psychopathology is associated with greater CUD severity among regular users, but little is known about the neural mechanisms underlying increased CUD vulnerability among this group of cannabis users. Identification of underlying neural mechanisms could lead to the development of a neurobehavioral profile with greater predictive power in estimating CUD risk and guide the development of novel interventions that can target these neural mechanisms directly. Preliminary electroencephalography (EEG) data has revealed that acute stress-elicited motivated attentional processing of cannabis-related cues (i.e., the late positive potential [LPP], a positive slow wave evoked by motivationally-salient stimuli) is enhanced in regular cannabis users with high relative to low internalizing vulnerability. Further, cannabis cue-elicited LPP amplitude in the context of acute stress was positively associated with CUD severity and trajectory in the high internalizing vulnerability group. Acute stress modulation of the cannabis cue-elicited LPP may be a valuable neurobiological signature of CUD risk in regular cannabis users with co-occurring internalizing psychopathology; theoretical and clinical implications will be discussed.

Marijuana and Me: Adapting the Implicit Association Test to Measure Associations Between Marijuana and the Self Among Late Adolescents

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The use of implicit measures of substance-related associations stems from dual process models of substance misuse that distinguish two classes of cognitive processes: implicit (i.e., relatively fast, automatic, reflexive) cognitions and explicit (i.e., relatively slow, controlled, reflective) cognitions. One crucial measure to the field has been the Implicit Association Test (IAT), a computerized reaction time task intended to measure the

strength of associations between constructs held in memory. Among marijuana research, IATs have been developed to measure associations between marijuana and 1) positive arousal words, 2) negatively valenced words, and 3) sedation words. However, studies examining the predictive validity of these IATs have found conflicting findings to date. One adaptation of the IAT that is consistently associated with drinking outcomes is an IAT measuring associations between drinking and one's self-concept. This presentation will discuss a mixed-methods approach to develop Marijuana-Identity IATs (MI-IATs) that assess the strength of associations between marijuana and the self among late adolescents (ages 15-18). To inform task development, focus groups with late adolescents will be conducted to improve our understanding of marijuana-related terminology and imagery described as typical among this age group. Using this feedback to select relevant words and images, MI-IATs will be developed and completed online by late adolescents ranging from lifetime non-users to current daily users. MI-IATs will be evaluated on the basis of psychometric properties (e.g., split-half internal consistency) and validity in predicting marijuana use and related consequences both concurrently and longitudinally.

Elucidating the Complex Interactions Between Socio-cultural, Neurocognitive and Drug-use-related Factors on Drug-use Trajectories

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Despite a growing body of research documenting that the social environment shapes neural structures and processes and vice versa, there is currently only a limited number of studies employing an integrated approach for exploring how these factors interact. The few studies available suggest that early, severe, and chronic exposure to adversity moderates the association between neurocognitive processes and adoption of risky behaviors. My current research aims to develop a transdisciplinary research program aimed at reducing drug-use disparities across and within minority populations by investigating the mutual back-and-forth influences between neurocognitive and social-cultural factors. Currently, I am exploring whether neurocognitive

factors - such as decision-making - mediate the associations between socio-cultural factors (e.g. poverty) and drug-use outcomes (e.g., cannabis-use trajectories) among a sample of young Latino adults. I am also studying whether socio-cultural factors (e.g., acculturative stress) moderate the associations between drug-use behaviors (e.g., cannabis use patterns) and neurocognitive processes (e.g., episodic memory). I believe collaborative interdisciplinary work integrating cognitive neuroscience and sociocultural research promises to significantly advance our understanding of the etiological mechanisms leading to drug-use disparities. I foresee that the Adolescent Brain Cognitive Development study (ABCD study) or The HEALthy Brain and Child Development Study (HBCD study), will allow us to investigate in depth these interactions within a life course health development framework. This will enhance our understanding of the dynamic and multilevel processes contributing to drug-use disparities. At the same time, this research will inform the development of developmentally and socio-culturally appropriate preventive interventions.

Using a System Science Approach to Understand the Dynamic Social Context of Adolescent and Young Adult Marijuana Use

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Aims: Group model building, a system science approach, was used to understand from youth how social complexities influence uptake, continuation and escalation of marijuana use. Methods: Two groups of marijuana exposed youth, aged 15-20, recruited from adolescent clinic, emergency department and the community participated in four, 2-hour workshops. Through structured activities (i.e. behavior over time graphs), participants generated a system dynamics model representing critical features of the complex and dynamic social system impacting marijuana use for youth in their community. Results: Youth (N=19) were African American, 42% male, mean age 17 yrs. Participants produced a causal loop diagram, including balancing and reinforcing loops, reflecting how interpersonal interactions

contribute to a high prevalence of marijuana use at the community level. The model illustrates how marijuana is used to cope with both life and romantic relationship stressors and to facilitate positive interactions with both partners and non-romantic peers. While adolescents identified how supportive behaviors in romantic relationships could be protective against substance use, issues with trust and vulnerability dominate so when conflicts arise, they increasingly resort to cycles of negative behaviors adding to increasing relationship stress and ultimately more marijuana use. Both groups generated the same system diagram. Conclusions: Youth articulated connections between multilevel factors, which feedback to maintain a high prevalence of marijuana use. Rather than influence initiation as hypothesized, romantic relationships impact continuation and escalation of marijuana use. Understanding how factors function as a system provides important information toward testing dynamic hypotheses and ultimately designing more impactful and synergistic interventions.

Medical Marijuana Laws and Substance Use Disorder Treatment: Thinking Beyond Marijuana Use

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Since 1996, 33 states have enacted medical marijuana laws (MMLs) and 10 states and DC also have legalized recreational marijuana use. MMLs can vary widely across states, particularly in terms of marijuana dispensary access and other provisions. Studies aiming to understand the effects of MMLs have primarily focused on proximal substance use outcomes, such as marijuana use prevalence across populations of interest. However, evidence suggests that MMLs may affect more distal outcomes, such as treatment for substance use disorders (SUDs). The mechanisms through which MMLs could affect SUD treatment utilization are complex and multi-layered. These mechanisms incorporate multiple systems, such as the specialty SUD treatment and criminal justice systems. In this presentation, we will discuss the challenges and opportunities of studying the effects of MMLs on SUD treatment, including leveraging strengths of different data sources to better understand mechanisms of action. Data from the National Survey on Drug Use and Health will be used to highlight measurement issues related to the operationalization of MML policy exposure, as well as how to estimate associations before and after MML enactment while controlling for secular changes in the outcomes of interest. The presentation will conclude with a discussion of planned research aims and steps to study recreational marijuana laws.

Examining the Therapeutic and Adverse Effects of Diverse Cannabis-Based Products Using Real-Time Data

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