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Young adults who smoke cigarettes and marijuana: Analysis of thoughts and behaviors

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Abstract

Introduction—Smoking both cigarettes and marijuana is increasingly common among young adults, yet little is known about use patterns, motivations, or thoughts about abstinence. In a U.S. sample, this study explored young adults' severity of cigarette and marijuana co-use, quit attempts, and thoughts about use.

Methods—Young adults age 18-to-25 who had smoked at least one cigarette in the past 30 days completed an anonymous online survey.

Results—Of 1987 completed surveys, 972 participants reported both past-month cigarette and marijuana use (68% male, 71% Caucasian, mean age 20.4 years [$SD=2.0$]). Frequency of use, temptations to use, measures of dependence, decisional balance, and past-year quit attempts were associated across the two substances (all $p<.05$), but not motivation to quit. Relative to marijuana, participants reported greater desire and a later stage of change for quitting cigarettes and were more likely to endorse a cigarette abstinence goal, yet they had lower expectancy of success with quitting cigarettes and with staying quit (all $p<.001$).

Conclusions—Cigarette and marijuana use, temptations to use, and pros/cons of using were related in this young adult sample. Differences in motivation and thoughts about abstinence, however, suggest that young adults may be more receptive to interventions for tobacco than marijuana use. Use patterns and cognitions for both substances should be considered in prevention and intervention efforts.

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Keywords

tobacco; cigarette; marijuana; young adulthood; Internet; survey

1. INTRODUCTION

1.1 Tobacco and marijuana co-use

Among young adults in the United States, cigarette smoking and marijuana use are strongly associated. In 2011, 36% of U.S. cigarette smokers aged 18–25 had used marijuana in the past month, almost three times the rate of the general adult population (Substance Abuse and Mental Health Services Administration, 2012a). A systematic review of studies of cigarette and marijuana co-use in adolescence and young adulthood found consistently (85%) significant associations (Ramo, Liu, & Prochaska, 2012b). Cigarette smoking is associated with initiation (Agrawal, Lynskey, Bucholz, Madden, & Heath, 2007; Lai, Lai, Page, & McCoy, 2000) and extent (Kapusta et al., 2007; Leatherdale, Hammond, Kaiserman, & Ahmed, 2007; Peters, Budney, & Carroll, 2012) of marijuana use in young adulthood. There is also a reverse relationship, whereby those who use marijuana in early young adulthood are more likely to initiate cigarettes use and have a greater likelihood of developing nicotine dependence than their non-marijuana using peers (Ramo et al., 2012b). Combined smoking of cigarettes and marijuana in young adulthood has been associated with worse health outcomes (e.g., poor lung function) than smoking either substance alone (Taylor et al., 2002).

There are multiple suggested mechanisms underlying the co-use of cigarettes and marijuana including both genetic and environmental factors (e.g., availability, route of administration; Agrawal, Budney, & Lynskey, 2012). Limited research has focused directly on cognitive factors sustaining co-use, but cigarette and marijuana co-use may be perpetuated in part by similar beliefs about the two substances or that one substance supports the use of another. For example, in a study of 233 college students who smoked both cigarettes and marijuana, 65% smoked both substances in the same hour; 31% smoked cigarettes to prolong and sustain the effects of marijuana; and 55% had friends who engaged in these behaviors, suggesting that use is related both behaviorally and socially (inhalation; Tullis, DuPont, Frost-Pineda, & Gold, 2003). Another explanation for perpetuation of co-use includes a phenomenon called “blunt chasing,” or the smoking of a cigarillo or cigar following a blunt (marijuana wrapped in a cigar shell), which reportedly increases the sense of euphoria from taking these drugs (Amos, Wiltshire, Bostock, Haw, & McNeill, 2004).

1.2 Patterns and thoughts about tobacco and marijuana co-use

The two most commonly used addictive substances among young adults, there is a need to examine whether behaviors and thoughts related to cigarettes and marijuana are similar among those who use both substances. If use and constructs associated with reducing use relate similarly across substances, it would support interventions that target both drugs simultaneously. Motivation to quit smoking cigarettes and marijuana is generally low among young adults (Diemert, Bondy, Brown, & Manske, 2013; Ramo & Prochaska, 2012b), suggesting that the Transtheoretical Model of behavior change (TTM; Prochaska & DiClemente, 1983) may be particularly appropriate to understand co-use of these substances. The TTM includes three interrelated constructs: stages of change, temptations to use, and decisional balance (pros and cons of using), that have been used to describe cigarette smoking and predict quitting (DiClemente et al., 1991; Gritz, Schacherer, Koehly, Nielsen, & Abemayor, 1999; Perz, DiClemente, & Carbonari, 1996; Prochaska et al., 1994; Stotts, DiClemente, Carbonari, & Mullen, 2000). Our development and earlier analysis (in the

current sample) of a staging scale for marijuana use was found to relate to concurrent frequency of marijuana use, temptations to use, and cons of using marijuana, consistent with what has been found in the cigarette smoking literature (Ramo, Liu, & Prochaska, 2012a).

Among young people, relapse to cigarettes and marijuana use is also high among those who have made a quit attempt. For example, in a review of 52 studies, median rates of smoking relapse among adolescents aged 20 or young who made a cessation attempt were 34% after one week and 89% after 6 months (Bancej, O'Loughlin, Platt, Paradis, & Gervais, 2007). In a study of 385 marijuana users who had made a self-initiated quit attempt, 88% had relapsed within 5 years (Chauchard, Levin, Copersino, Heishman, & Gorelick, 2013). Constructs of thoughts about abstinence, including desire to quit, perceived success at quitting, difficulty with staying quit, and abstinence goals, as originally described in Marlatt's Relapse Prevention model (Marlatt & Gordon, 1985), are also predictive of cigarette and other substance use outcomes (Hall, Havassy, & Wasserman, 1990 1991) and related to TTM constructs (Prochaska et al., 2004). Applied to marijuana, the thoughts about abstinence items assessing desire to quit, perceived success, anticipated difficulty, and abstinence goal correlated significantly with frequency of marijuana use and stage of change (Ramo et al., 2012a).

Young people may think differently about their cigarette smoking and marijuana use. For example, the 2011 National Survey of Drug Use and Health showed that, 66% of youth age 12 to 17 perceived "great harm" from smoking one or more packs of cigarettes per day, compared to 45% for smoking marijuana once or twice a week (although frequencies of use differed for the cigarette and marijuana items; Substance Abuse and Mental Health Services Administration, 2012b). In a qualitative study of 99 adolescents who smoked cigarettes and marijuana, while most desired to quit smoking cigarettes at some point in the future, few intended to stop using marijuana (Amos et al., 2004). Conversely, among youth surveyed in an addictions treatment program, intention to quit smoking cigarettes was lower than intention to quit using drugs (Ramo, Prochaska, & Myers, 2010). Study of more representative samples is needed to explore cigarette and marijuana co-use patterns and cognitions.

1.3 Present study

In a national, anonymous, cross-sectional survey of young adults who smoke cigarettes and use marijuana, the current investigation examined the relationship between: severity of use and quit attempts (Aim 1), thoughts about abstinence (Aim 2), and TTM constructs of stage of change, temptations, and decisional balance (Aim 3). For Aim 1, we hypothesized that greater cigarette use would be associated with greater marijuana use. We also explored the association between past year quit attempts for the two substances without an explicit hypothesis. For Aim 2, given perceptions that cigarette smoking is more harmful and less socially acceptable than marijuana use among young people, we hypothesized young adults would have a stronger desire to quit and be more likely to have a goal of abstinence for cigarettes than marijuana. Further, given that cigarette smoking is legal federally and in more states, more readily available, and publicly used than marijuana, we expected that co-users would have lower efficacy for quitting cigarette smoking and staying quit from cigarettes than marijuana. For Aim 3, we hypothesized that the stage distributions would differ for cigarettes and marijuana with more young adults in preparation for quitting smoking than quitting marijuana. Given strong associations between cigarette smoking and marijuana use (Agrawal et al., 2012; Ramo et al., 2012b), we anticipated temptations to use and that the pros and cons of using (decisional balance) would be associated across the two substances. Given that temptations and decisional balance are known to vary by stage of change (DiClemente et al., 1991; Prochaska et al., 1994), we included stage of change for both cigarettes and marijuana as covariates in examination of Aim 3 hypotheses.

Understanding young adults' co-use and their thoughts about use of cigarettes and marijuana will help inform whether interventions should be targeted similarly, and possibly even simultaneously, for the two substances.

2. METHODS

2.1 Participants and Procedure

Data for the present study were taken from a U.S.-based Internet survey of English-literate young adult cigarette smokers aged 18 to 25. Characteristics of the full sample and the three recruitment methods utilized (Facebook ads, Craigslist postings, survey sampling company) have been described previously (Ramo, Hall, & Prochaska, 2010; Ramo & Prochaska, 2012a). Advertisements that targeted young adult cigarette smokers or cigarette and marijuana users contained a hyperlink that directed potential participants to a separate website that included: 1) the study's IRB-approved consent form with verification questions to determine understanding of the consent process; and 2) a screener for determining eligibility including English literacy. The survey assessed demographic characteristics and then cigarette and marijuana use and thoughts about use as well as alcohol use for inclusion as a covariate. Participants were required to answer all questions before they could continue to the next page of the survey, but could quit the survey at any time. Computer IP addresses were tracked with one entry allowed from a single computer to prevent duplicate entries from the same person; however, multiple entries were allowed from the same Internet connection (e.g., dormitories, apartment buildings).

Over 7567 people accessed the online survey, 7260 signed online consent, and 4242 met criteria to participate (age 18 to 25, smoked at least 1 cigarette in the past month). Eligibility checks excluded 494 respondents who had invalid data due to verifiably inaccurate responses, leaving 3748 valid entries (88% of those who met criteria), of which 1987 (53% of valid entries) completed the entire 30–45 minute survey. The 972 survey completers who reported use of both cigarettes and marijuana (49% of survey completers) were included in the present analyses.

2.2 Measures

The cigarette and marijuana online measures used in the current study were previously analyzed for reliability and validity with a separate sample of young adults and demonstrated to be appropriate and well-understood (Ramo, Hall, & Prochaska, 2011; Ramo et al., 2012a).

2.2.1 Sociodemographics—Participants self-reported their gender, age, race/ethnicity, student status, employment status, annual family income, highest parental level of education, and subjective social status in relation to the traditional socioeconomic status indicators (SES ladder; scale 0–10; Adler, Epel, Castellazzo, & Ickovics, 2000). Residential zip codes were used to categorize participants as residing in: 1) one of four U.S. Census Regions: Northeast, Midwest, South, and West (U. S. Census Bureau, 2010); and 2) an urban or rural area (Rural Health Research Center, 2011).

2.2.2 Cigarette smoking—The Timeline Followback (TLFB; Brown et al., 1998), which presents a calendar and asks participants to retrospectively estimate their daily cigarette consumption over 30 days prior to the assessment, was used to calculate days smoking any cigarettes in the last 30. Reported past year 24-hour quit attempts was dichotomized as yes/no, and time to first cigarette upon waking (<30 min or >30 min) was used as a measure of dependence. Time to first cigarette accounts for much of the predictive validity of the full Fagerström Test for Nicotine dependence and has greater predictive validity than other

measures of nicotine dependence (Heaviness of Smoking Index; Nicotine Dependence Syndrome Scale; Wisconsin Inventory of Smoking Dependence Motives; Baker et al., 2007).

2.2.3 Marijuana use—Items from the 2008 National Survey of Drug Use and Health (NSDUH; Harrison, Martin, Enev, & Harrington, 2007) assessed past year marijuana quit attempts of 3 days or longer, dichotomized as yes/no. The TLFB for marijuana use (Sobell & Sobell, 1996) asked participants to retrospectively estimate their daily marijuana consumption in the 30 days prior. Frequency of past 30-day marijuana use was calculated (range: 0–30).

Marijuana dependence symptoms were assessed initially with the 10-item Cannabis Use Disorder Identification Test (CUDIT; range: 0–40) and then switched after 8 months of recruitment ($n=777$) to the 8-item Cannabis Use Disorder Identification Test-Revised (CUDIT-R; range: 0–32) with improved psychometrics. For both measures, scores are summed. Cut-off values for possible presence of a cannabis use disorder are 8 for the CUDIT and 13 for the CUDIT-R. As scale total scores were slightly different for the two measures, CUDIT and CUDIT-R scores were converted to z-scores and pooled.

2.2.4 Thoughts about cigarette and marijuana use—The 3-item Smoking Stages of Change scale assessed motivation to quit smoking cigarettes (Prochaska & DiClemente, 1983) categorizing smokers into one of three pre-action stages of change (Precontemplation: no intention to quit within the next 6 months; Contemplation: intention to quit within the next 6 months but no 24-hr quit attempt in the past year; Preparation: intention to quit within the next month and a 24-hr quit attempt in the past year). We adapted the Smoking Stages of Change form to assess stage of change for marijuana use, which demonstrated good concurrent criterion validity in our sample (Ramo et al., 2012a). The Thoughts about Abstinence form (Hall et al., 1990) assessed current desire to quit, anticipated success with quitting, and perceived difficulty with staying quit from cigarettes (scored on scales from 1 to 10). Abstinence goals were categorized as complete abstinence, no change, or an intermediate or reduction goal. We adapted this measure for marijuana use and previously demonstrated adequate construct validity through relationships to marijuana use (Ramo et al., 2012a). Cigarette smoking temptation was measured with the 9-item Smoking Temptation – Short Form (range: 9–45; Velicer, DiClemente, Rossi, & Prochaska, 1990). To assess temptations to use marijuana, we adapted a 30-item scale previously used to assess temptations to use alcohol and also cocaine (range: 30–150; Snow, Prochaska, & Rossi, 1994). Raw scores were converted to percent of total score for comparison between cigarette and marijuana measures. The 6-item Smoking Decisional Balance – Short Form (Velicer, DiClemente, Prochaska, & Brandenburg, 1985) assessed the pros (range: 1–15) and cons (range: 1–15) of smoking cigarettes. An adapted version of the 42-item Decisional Balance-Drug and Alcohol Use Scale (range: 42–210) assessed the pros (range: 22–110) and cons (range: 20–100) of marijuana use (King & DiClemente, 1993). For the scales of pros and cons, raw scores were converted to z-scores for comparison across substance.

2.2.5 Alcohol use—Timeline follow-back procedures for alcohol (Sobell, Brown, Leo, & Sobell, 1996) assessed number of drinking days in the past 30. This was included as a covariate in analyses of cigarette smoking and marijuana use.

2.3 Analyses

Regression models tested associations between days using marijuana and smoking cigarettes in the past 30 days (linear regression) and severity of marijuana (CUDIT) and cigarette use (time to first cigarette; logistic regression) with included covariates of age, gender, ethnicity,

household income, subjective social status, student status, and geographic region, and days drinking in the past 30, given the variables demonstrated significant associations with marijuana use among cigarette smoking young adults (Ramo, Delucchi, Hall, Liu, & Prochaska, 2013) or cigarette and marijuana co-use (Ramo & Prochaska, 2012b). Chi-square tests examined relationships between cigarettes and marijuana on 1) the likelihood of making a past year quit attempt, 2) abstinence goal, and 3) stage of change. Odds ratios were used to evaluate the likelihood making a quit attempt and having an abstinence goal for one substance, given the likelihood of making a quit attempt or having an abstinence goal for the other substance. Paired sample t-tests and correlations examined the relationships between thoughts about cigarette and marijuana abstinence, temptations to use cigarettes and marijuana, and pros and cons of cigarette and marijuana use overall and within each stage of change.

3. RESULTS

Sociodemographic, cigarette, and marijuana use characteristics of the sample are summarized in Table 1.

3.1 Use, dependence, and quit attempts

In the past month, the sample smoked cigarettes on 73% of assessed weekdays (14/20 days on average) and 74% of assessed weekend days (7/10 days on average). Marijuana was used on 55% of assessed weekdays (11/20 days on average) and 56% of assessed weekend days (6/10 days on average). Young adults used cigarettes on more days of the past 30 ($M=22.8$ days; $SD=11.1$) than they used marijuana ($M=17.1$; $SD=11.6$; paired samples $t(971)=12.75$; $p < .001$). Table 2 shows the relationship between cigarette and marijuana use and dependence, controlling for demographic characteristics and the number of days drinking alcohol in the past 30. The linear regression model predicting cigarette use frequency (days using in the past 30) was significant $\chi^2=11.32.94$, $R^2=.17$, $p<.001$; Model 1). Significant variables in the model were marijuana use frequency (days using in the past 30), white ethnicity (compared to Hispanic/Latino), lower subjective social status, student status, residence in the northeast or midwest (compared to the west), and drinking frequency in the past 30 days. The logistic regression model predicting time to first cigarette was also significant ($\chi^2=102.94$, $R^2=.10$, $p<.001$; Model 2). Significant variables in the model were the CUDIT score of cannabis dependence, age, ethnicity, household income, subjective social status, student status, and region of residence.

A majority of participants reported a failed quit attempt in the past year, 59% for cigarettes and 62% for marijuana. Attempting to quit smoking cigarettes was associated with a two-fold greater likelihood of attempting to quit marijuana (OR 1.98, 95% CI [1.53, 2.58]; $\chi^2(971) = 26.3$, $p < .001$).

3.2 Thoughts about Abstinence

At the time of the survey, participants reported greater desire to quit smoking cigarettes than marijuana (cigarettes: 5.3 vs. marijuana: 2.5; $t(971) = 25.00$, $p < .001$), but also lower expected success with quitting cigarettes (cigarettes: 6.0 vs. marijuana: 6.8; $t(971) = -6.4$, $p < .001$) and greater perceived difficulty with staying quit from cigarettes (cigarettes: = 6.5 vs. marijuana = 4.5; $t(971) = 15.4$, $p < .001$). Measures of desire to quit cigarettes and marijuana ($r = .19$, $p < .001$) and expected success with quitting cigarettes and marijuana ($r = .15$, $p < .001$) were weakly, though significantly, associated. Measures of perceived difficulty with staying quit from cigarettes and marijuana were not significantly associated ($r = .06$, $p = .086$). Figure 1a shows the distribution of abstinence goals for cigarettes and marijuana. While a larger proportion of the sample held a goal of complete abstinence for

cigarettes than marijuana (8% vs. 2%, $\chi^2_1 = 16.16, p < .001$), wanting to quit cigarettes for good was associated with a greater odds of having a complete abstinence goal for marijuana (OR=6.10, 95% CI [2.25, 16.57], $p < .001$). Overall, however, only 0.6% of the sample ($n=6$) identified a complete abstinence goal for both substances, while 20% had no goal for either substance.

3.3 Stage of change, temptations, decisional balance

More participants intended to quit smoking cigarettes in the next 6 months than marijuana (51% versus 15%; Figure 1b). The association in stage membership for the two substances was not statistically significant, $\chi^2_4 = 9.32, p = .054$. Only 2% of the sample intended to quit both drugs in the next 30 days (preparation stage for both substances), while 43% was in precontemplation for both cigarettes and marijuana.

Temptations to use marijuana and cigarettes were positively correlated ($r = .26, p < .001$), though participants reported greater temptations to use cigarettes ($M = .70; SD = .18$) than marijuana ($M = .60; SD = .20$; paired samples $t(971) = 13.75; p < .001$). Associations between cigarette and marijuana temptations, examined within stage of change for quitting cigarette smoking, remained significant ($p < .001$).

For the two substances, the pros ($r = .38, p < .001$) and cons ($r = .27, p < .001$) for using were significantly associated. Again, associations examined within cigarette stage of change remained significant ($p < .001$). Comparisons indicated greater pros ($M = .59; SD = .23$) and greater cons ($M = .48; SD = .23$) of cigarette smoking relative to marijuana use (pros, $M = .51, SD = .18$; paired samples $t(971) = 11.1; p < .001$ and cons, $M = .35, SD = .16$; paired samples $t(971) = 16.8; p < .001$).

4. DISCUSSION

4.1 General Discussion

This study examined differences in patterns of cigarette smoking and marijuana use, quit attempts, and thoughts about use and abstinence in a national online sample of young adults who used both substances. Consistent with previous cross-sectional (Abdel-Ghany & Wang, 2003; Gledhill-Hoyt, Lee, Strote, & Wechsler, 2000; Rigotti, Lee, & Wechsler, 2000) and longitudinal (Siqueira & Brook, 2003; Timberlake et al., 2007; Wade & Pevalin, 2005) research, the frequency and severity of cigarette and marijuana use were related as were quit attempts and some cognitions related to use.

Frequency of alcohol use independently predicted cigarette use frequency, consistent with prior research with young adults (Jiang & Ling, 2013; Weitzman & Chen, 2005), yet was unrelated to the measure of nicotine dependence. Epidemiological data indicate young adult drinking and smoking are highly co-morbid with the risk of co-use of alcohol and tobacco found at any level of smoking (experimenters through heavy smokers; Reed, Wang, Shillington, Clapp, & Lange, 2007; Weitzman & Chen, 2005). The consistent association between cigarette, marijuana, and alcohol use in young adults, regardless of level of dependence, supports interventions to target these multiple substances concurrently.

While young adults' cigarette and marijuana use frequency and severity were related, as were some of their thoughts about use, reported levels of interest and perceived ability with quitting were found to differ in interesting ways. Despite greater desire to quit cigarettes, greater preparation stage membership, and greater likelihood of tobacco abstinence goals, participants also reported more temptations to use tobacco, less expected success with quitting, greater perceived difficulty staying quit, and identified more pros as well as cons for using cigarettes. Very few individuals in this study were ready to quit both cigarettes and

marijuana concurrently, and being motivated to quit one substance was not associated with being motivated to quit the other substance. Young adults may be more receptive to interventions for cigarettes than marijuana use, especially interventions that seek to increase self-efficacy for quitting and staying quit by providing cognitive and behavior skills to manage smoking urges. Notably, however, a sample majority reported a past year failed quit attempt for both tobacco (59%) and marijuana (62%), and a quit attempt on one substance was associated with a 2-fold greater likelihood of a quit attempt for the other. It would seem that behaviorally, a majority of young adults are reporting recent unsuccessful efforts to quit both substances. In adults, there is mixed evidence as to whether marijuana use interferes with tobacco treatment outcomes (Gourlay, Forbes, Marriner, Pethica, & McNeil, 1994; Hendricks, Delucchi, Humfleet, & Hall, 2012; Humfleet, Muñoz, Sees, Reus, & Hall, 1999; Stapleton, Keaney, & Sutherland, 2009). Data from the present study suggest that clinicians should not be deterred from supporting cigarette smoking cessation efforts for young people who use both cigarettes and marijuana.

Given that many young people in the community are not ready to quit using marijuana, intervention strategies ought to include those designed to increase motivation (e.g., Motivational Interviewing, increasing pros of behavior change, consciousness raising about problems associated with marijuana use). It could also be important to assess young people's perceptions of the interaction between cigarette and marijuana use to identify relapse risk and target prevention efforts accordingly (Ramo, Liu, & Prochaska, 2013). Finally, brief, motivational interventions matched to risk level such as Screening, Brief Intervention, and Referral to Treatment (SBIRT; Woodruff, Eisenberg, McCabe, Clapp, & Hohman, 2013) could be particularly helpful with young adults who may be at risk for problems associated with substance use but may not be physically dependent or willing to engage in more intensive treatment. SBIRT screens individuals with substance use and administers treatment tailored to risk: those with low risk are given a time-limited motivational interview to increase awareness of risks, while those with high risk are offered more intensive treatment. Given the frequency of cigarette and marijuana use among young adults, SBIRT screening protocols should consider substance co-use in delineating risk profiles of patients.

In contrast to thoughts about abstinence, cognitions related to temptations to use and decisional balance for cigarettes and marijuana were related in our study and notable given measurement differences for the two behaviors. The smoking temptations measure was shorter and assessed three domains (positive affect, negative, and habitual/craving; Velicer et al., 1990), while the marijuana temptation scale was longer with only one factor (Snow et al., 1994). Post hoc analyses demonstrated that within each substance, temptations and pros of using decreased while cons of using increased across the stages of change, consistent with work found by others across a number of health behaviors (Di Noia & Prochaska, 2010; DiClemente et al., 1991; Prochaska et al., 1994; Figures available as Appendix, data available upon request from the first author). The findings further validate the TTM constructs of temptations and decisional balance in a young adult population applied to both cigarettes and marijuana, and suggest that for both substances, interventions should target decreasing the pros and increasing the cons of using to facilitate movement toward preparation and action.

4.2 Limitations

Relying on self-report, a study limitation is that respondents may not have recalled their behaviors accurately. Confirming recent cigarette and marijuana use with biological data would have compromised anonymity and greatly increased study costs while decreasing study reach. Previously, we demonstrated good reliability and validity of young adults' anonymous online reporting of cigarette (Ramo et al., 2011) and marijuana (Ramo et al., 2012a) use as compared to multiple measures of these behaviors and national

epidemiological data. Study design was cross-sectional rather than longitudinal, preventing examinations of thoughts about cigarette smoking and marijuana use in relation to future substance use behavior. This national online survey was a convenience rather than a representative sample of young adult smokers, and thus findings may differ from previous work due to differences in survey methodology or self-selection bias. Further, online recruitment strategies may have over-sampled males and under-sampled African-Americans compared to the population of young adult smokers (Ramo, Hall, et al., 2010).

There were some slight differences between cigarette and marijuana measures assessed in this study, including length of quit attempt (24 hrs for cigarettes and 3 days for marijuana) based on differences in frequency of administration. Cognitions examined in this study were not exhaustive and instead focused on the TTM and models of relapse prevention and addiction.

4.3 Conclusions

This study evaluated cigarette and marijuana use and thoughts about use among young adults who used both substances in the past month surveyed anonymously online. Importantly, this study examined associations across multiple constructs and showed that while use was related for both substances, young adults were more ready to quit smoking cigarettes but perceived it to be harder than quitting marijuana. Future research should examine the relationship between cigarette and marijuana use when it occurs in the same use episode (e.g., mixing marijuana with cigarettes) and apply methods such as ecological momentary assessment, which can evaluate the extent to which use of one substance and cognitions during use facilitate or substitute for use of the other. Given the recent slowing in the decline of cigarette use among young adults (King, Dube, Kaufmann, Shaw, & Pechacek, 2011) and the growing use of marijuana among young people across the US (Substance Abuse and Mental Health Services Administration, 2012b), an understanding of how young people think about their use of both substances is important for informing treatment and prevention efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Research Highlights

- An anonymous online survey assessed cigarette and marijuana use among young adults
- Young adult cigarette smokers living in the U.S. were recruited and surveyed online
- Use frequency, dependence, temptations, decisional balance, and past-year quit attempts were associated
- Motivation and thoughts about abstinence differed
- Findings inform treatment and prevention efforts for young people

Figure 1a.

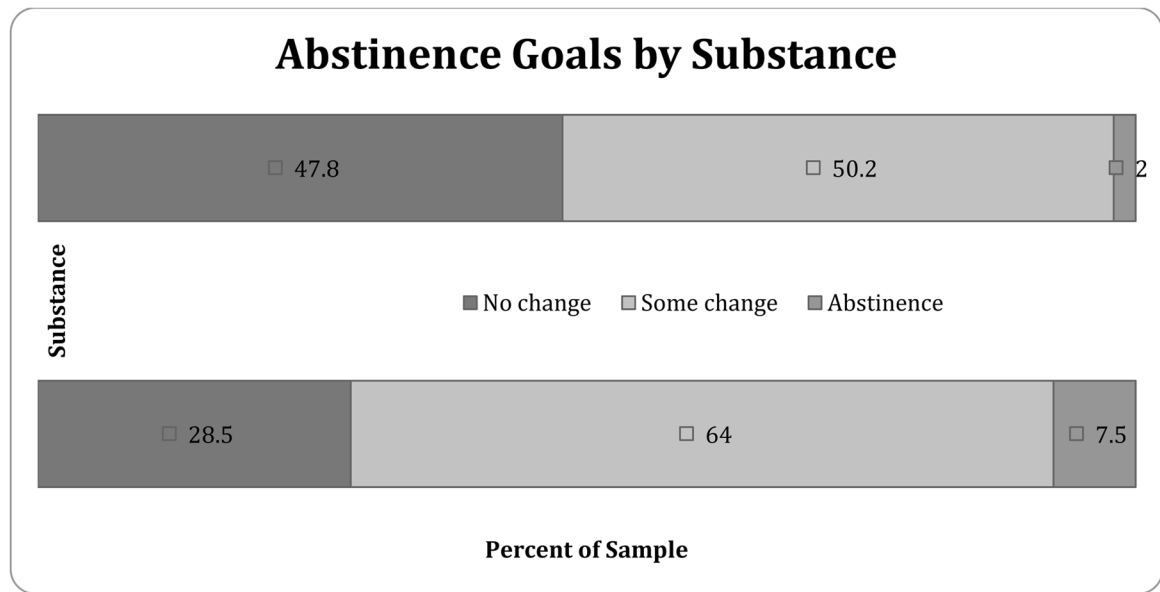


Figure 1b.

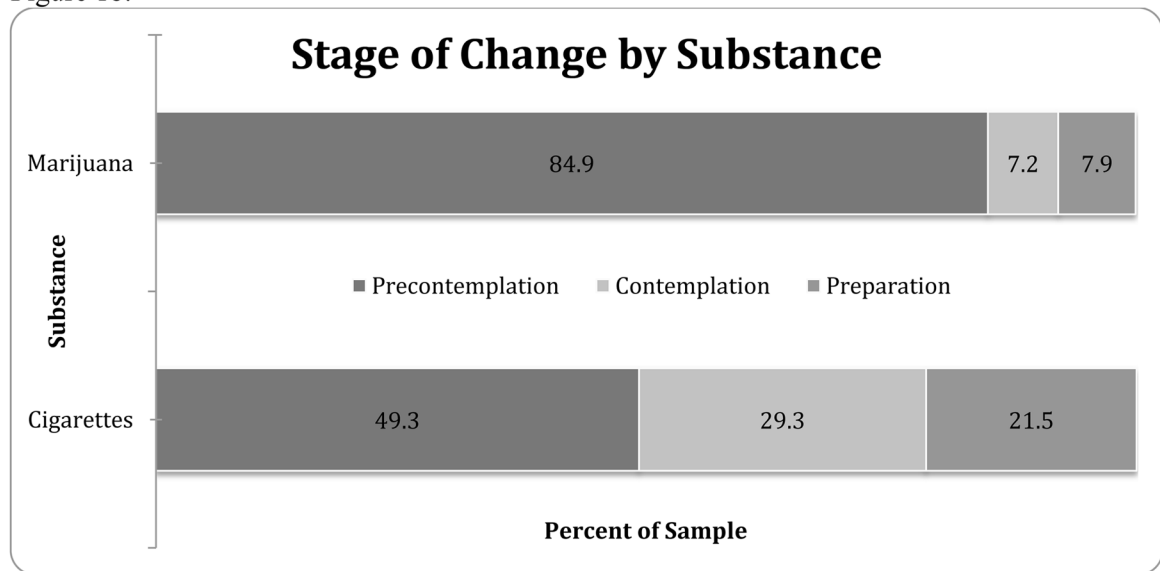


Figure 1.

a. Comparison of abstinence goals for cigarettes and marijuana use among young adults who use both substances. Abstinence goals were related across substances ($\chi^2_1 = 16.16, p < .001$). b. Stage of change was compared across substance. There was not a significant difference in the distribution of stages of change across cigarettes and marijuana ($\chi^2_4 = 9.32, p = .054$).

Table 1

Sociodemographic, cigarette, and marijuana use characteristics of young adult tobacco and marijuana users ($N = 972$)

	Mean (SD) or percent
Gender	
Female	31.3
Male	68.4
Transgender	0.3
Age – M (SD)	20.4 (2.0)
Ethnicity	
African-American	2.9
Asian-American/Pacific Islander	3.0
Caucasian	71.4
Hispanic/Latino	6.2
Multi-ethnic	11.4
Other	5.1
Student status - % current student	30.6
Employment status	
Employed (≥ 20 hours a week)	26.0
Employed part-time (<20 hours a week)	16.0
Unemployed/Retired/Homemaker	27.4
Student	30.6
Annual household income	
Less than \$20,000	23.9
\$20,000 – \$60,000	34.6
\$60,000 – \$100,000	21.4
Over \$100,000	19.9
Highest level of parental education	
Some high school or less	2.8
Completed high school/GED	15.1
Some college	15.4
Completed college	33.4
Some graduate work/A graduate degree	31.9
Subjective social status – M (SD)	5.3 (1.9)
Region	
Northeast	18.4
Midwest	24.9
South	27.4
West	29.3
Urban or rural - % urban	87.7
Days smoking cigarettes in the past 30 – M (SD)	22.8 (11.1)
Frequency of cigarette smoking, past 30 days	

	Mean (SD) or percent
1–5 days.	16%
6–10 days	7%
11–20 days	9%
21–30 days	69%
Past month daily smokers	64.8
Cigarettes per day – <i>M(SD)</i>	7.5 (6.9)
Daily smokers – <i>M(SD)</i>	10.7 (6.5)
Nondaily smokers – <i>M(SD)</i>	1.7 (2.3)
Years smoking cigarettes – <i>M(SD)</i>	3.9 (3.1)
% smoking within 30 minutes of waking	37.1
Days using marijuana in the past 30 – <i>M(SD)</i>	17.1 (11.6)
Frequency of marijuana use, past 30 days	
1–5 days.	26%
6–10 days	11%
11–20 days	17%
21–30 days	46%
Past month daily marijuana users	21.3
Years using marijuana – <i>M(SD)</i>	5.3 (2.9)
% CUDIT above suggested cut-off ^a score – <i>M(SD)</i>	59%

Notes: marijuana = marijuana; CUDIT = Cannabis Use Disorder Identification Test; CUDIT-R = Cannabis Use Disorder Identification Test – Revised.

^aSuggested cut-off for problematic use is a score of 8 or higher.

^bSuggested cut-off for problematic use is a score of 13 or higher.

Table 2

Regression Model results (N=970)^a

Variable	Model 1: Predicting Days smoking, past 30 days			Model 2: Predicting time to first cigarette (<30 minutes after waking)		
	B (SE)	t	p	OR [95% CI]	p	
Age	.09 (.17)	.51	.61	1.14 [1.06, 1.22]	<.001	
Gender ^b	1.36 (.72)	1.88	.06	1.16 [.86–1.56]	.346	
Ethnicity ^c					.010	
Asian	-1.42 (1.98)	-.72	.472	2.38 [1.06–5.29]	.036	
African-American	-2.90 (2.00)	-1.45	.149	.72 [.31–1.64]	.427	
Hispanic	-4.28 (1.40)	-3.05	.002	.46 [.24–.89]	.022	
Other	-1.31 (.90)	-1.45	.147	.71 [.48–1.05]	.088	
Household income ^d					.067	
<\$20,000	.36 (1.08)	.33	.742	1.81 [1.13–2.89]	.013	
\$20,000–\$60,000	.55 (1.01)	.55	.586	1.69 [1.08–2.62]	.021	
\$61,000–\$100,000	1.03 (1.05)	.99	.324	1.38 [.87–2.12]	.176	
Subjective social status	-.55 (.19)	-2.92	.004	1.96 [1.41–2.73]	.026	
Student status ^e	3.29 (.75)	4.38	<.001	1.96 [1.41–2.73]	<.001	
Region ^f					.029	
Northeast	2.96 (.99)	3.00	.003	1.12 [1.77–1.63]	.557	
South	1.09 (.88)	1.24	.215	1.71 [1.17–2.50]	.006	
Midwest	3.21 (.92)	3.50	.001	1.43 [.94–2.17]	.093	
Urban/Rural ^g	1.71 (1.02)	1.68	.095	1.41 [.93–2.14]	.102	
Days drinking, past 30	.22 (.04)	5.08	<.001	1.00 [.98–1.02]	.891	
Days using marijuana, past 30	.21 (.02)	7.25	<.001			
CUDIT				1.25 [1.08–1.46]	.003	

Notes: OR = odds ratio; CI = confidence interval; CUDIT = Cannabis Use Disorder Identification Test.

^a n=2 participants identified as transgender and were excluded from analyses due to small n.

^b Reference category is male.

^c Reference category is Caucasian.

^dReference category is >\$100,000.

^eReference category is Student (yes).

^fReference category is West.

^gReference category is urban. Fit statistics for Model 1: $F=11.32$, $R^2=.17$, $p<.001$. Fit statistics for Model 2: $\chi^2=102.94$, $P<.001$.