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Brief Report
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Brief Report

Prospective and Daily Effects of Cannabis Use on Smoking Outcomes During a Self-Guided Quit Attempt

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Abstract

Introduction: Past research suggests that cannabis use is a risk factor for relapse in people trying to quit smoking. Most people attempt to quit smoking without any assistance (ie, self-guided quitters), yet no one has examined the association between cannabis use and relapse among self-guided quitters. The current study examines how cannabis use might contribute to poorer smoking outcomes in a sample of self-guided quitters.

Aims and Methods: Data were taken from a study of unaided smoking cessation in 62 single-smoker couples. Quitters and their Partners completed baseline questionnaires and a 21-day ecological momentary assessment. This article examines Quitters' and Partners' past-year cannabis use reported at baseline and daily cannabis use during the ecological momentary assessment as predictors of prospective and daily smoking outcomes.

Results: We found very little evidence that past-year cannabis use was associated with poorer smoking outcomes. However, Quitters reported greater smoking on days when they or their Partners reported cannabis use.

Conclusions: This study produced evidence to support daily Quitter and Partner cannabis use as a risk factor for poor smoking outcomes. Smoking cessation programs might benefit from targeting cannabis use as well as taking a couples-oriented approach to treatment.

Implications: This article examined how cannabis use impacts smoking outcomes in a sample of self-guided quitters using prospective and daily diary analyses. We found very little evidence that past-year cannabis use was associated with poorer smoking outcomes. However, Quitters reported greater smoking on days when they or their Partners reported cannabis use. Findings suggest that smoking cessation programs might benefit from targeting cannabis use, as well as taking a couples-oriented approach to treatment.

Introduction

Cigarette smoking (hereafter, smoking) is the leading cause of preventable death in the United States, yet roughly 34.3 million adults in the United States currently smoke.[1] Nearly 70% of adults who smoke report wanting to quit, and just over half have made a quit attempt in the past year.[1] Most smokers attempt to quit on their own (ie, self-guided quitters)[2]; however, 95% of self-guided quitters relapse within 6–12 months.[3] To promote successful outcomes among self-guided quitters, risk factors for relapse need to be examined in this population. Cannabis use is more common among people who smoke cigarettes (21.8%) than people who do not (7.1%).[4] Furthermore, daily cannabis use is more common among daily (9.01%) and nondaily (8.03%) cigarette smokers than former (2.79%) and never smokers (1.05%).[5] Therefore, the current study focuses on cannabis use as a risk factor for poorer smoking outcomes among smokers making a self-guided quit attempt.

Research on cannabis use and smoking outcomes is mixed. More frequent cannabis users are less likely to make a quit attempt.[6] In

fact, cannabis users are more likely than nonusers to continue to smoke cigarettes after 13 years.[7] Cannabis use is also associated with less success in reducing and abstaining from smoking among smokers enrolled in an online intervention or receiving clinical treatment.[8,9] However, some studies have reported no effect of cannabis use on smoking outcomes among smokers receiving pharmacological and behavioral assistance in clinical trials.[10,11]

Given these inconsistencies, the role that cannabis might have in influencing smoking is unclear. To our knowledge, this is the first study to examine how cannabis use influences smoking outcomes among self-guided quitters currently engaged in a quit attempt. Furthermore, the romantic partner plays a crucial role in smoking cessation. For example, smokers are less likely to successfully quit when their partner also smokes.[12] One possibility is that exposure to cigarette (and other drug) cues elicits craving which can result in relapse.[13,14] If cannabis smoking serves as a drug cue, then even a partner's cannabis use might be detrimental to a smoker's outcomes. Despite this possibility, we are not aware of any studies that examine cannabis use and its effects on smoking outcomes in romantic dyads.

In the current study, we examined the effect of one smoking partner's (ie, Quitter) and one nonsmoking partner's (ie, Partner) cannabis use on smoking outcomes during a 21-day self-guided quit attempt. We collected information about cannabis use and smoking at baseline, through ecological momentary assessment (EMA), and at follow-up. We expected: (1) in prospective analyses, Quitters who reported past-year cannabis use at baseline would have poorer final smoking outcomes and (2) in daily diary analyses, on days that Quitters reported cannabis use, they would also be more likely to report smoking. We also examined the role of the Partner's cannabis use on the Quitter's smoking outcomes in exploratory analyses.

Materials and Methods

Participants

Data for this paper were taken from the Daily Experiences with Smoking Cessation (DESC) Study,[15,16] an EMA study that followed couples (ie, one smoker interested in quitting [Quitter] and one never/former smoker [Partner]) through a 21-day self-guided quit attempt. Quitters had to meet smoking criteria (smoked 10+ cigarettes per day for the past 2+ years; no non-cigarette forms of tobacco; motivation to quit of 50+ on a 1–100 scale; not seeing a provider or taking medication to quit smoking). Couples also had to meet relationship criteria (a different-sex relationship; cohabiting 6+ months or married), demographic criteria (both partners aged 18–55; comfortable reading/writing English), logistical criteria (partners lived together; both could access smart phones during the day), and safety criteria (ie, no severe intimate partner violence). Both partners had to agree to participate, and the Quitter had to stop smoking 12 hours prior to the first appointment (verified with an expelled breath carbon monoxide [CO] reading of <10 parts per million [ppm]).[17] Of 2223 people screened, 126 couples were eligible, and 64 couples attended the initial appointment. One couple did not reschedule after a failed CO reading, and one couple dropped the first day of participation, leaving a final sample of 62 couples.

Procedure

Couples completed background questionnaires online before the orientation session, including measures of cigarette dependence and demographics. At their orientation session, they completed an expelled breath CO test using a Bedfont piCO Smokerlyzer. Participants who failed the CO test (6%) rescheduled their appointment, but those who passed completed additional laboratory tasks and questionnaires, including an assessment of past-year cannabis use. Then both partners were given Android smart phones and training for the EMA.

For the next 21 days, both partners completed the EMA using a web application. Each day, they completed Morning Reports upon waking, three Random Prompt Reports when signaled, and Evening Reports before bed. They also completed a Lapse Report anytime the Quitter lapsed (or the Partner thought the Quitter lapsed). These reports included questions about mood, interactions with others, and other daily events, in addition to the target questions regarding smoking and cannabis use. After completing the EMA, couples attended a follow-up session. They completed follow-up questionnaires and reports of recent smoking were biochemically verified using an expelled breath CO test. They returned the study smart phones and received payment (up to 150 USD per partner).

Measures

Baseline Covariates

Participants completed demographic information, including age, race, education, and marital status. Quitters completed the 6-item Fagerström Test for Cigarette Dependence ($\alpha = 0.65$).[18]

Baseline Cannabis Use

Participants reported past-year cannabis use on a scale from 1 (not at all) to 6 (every day). Among the 33 Quitters (54%) and 18 Partners (30%) who reported past-year cannabis use, frequencies ranged from using cannabis only once (Quitters = 6, Partners = 7), a few times (Quitters = 12, Partners = 5), 1–3 times a month (Quitters = 1, Partners = 0), 1–3 times a week (Quitters = 3, Partners = 2), 4–6 times a week (Quitters = 0, Partners = 2), to every day (Quitters = 8, Partners = 2). Given these heavily skewed distributions, we dichotomized the variables (0 = no past-year use, 1 = past-year use).

EMA Cannabis Use

Participants reported in each Evening Report whether they had used cannabis that day (0 = no, 1 = yes). Quitters reported using cannabis on an average of 1.98 (standard deviation [SD] = 4.53, range = 1–22) days during the EMA phase, for a combined total of 123 days of cannabis use. Partners reported using cannabis on an average of 0.94 (SD = 3.51, range = 1–18) days during the EMA phase, for a combined total of 58 days of cannabis use.

Cigarette Smoking Outcomes

We calculated whether quitters *smoked* on each day of the EMA phase (0 = did not smoke, 1 = smoked), and the *number of cigarettes* they smoked each day (range = 0–28). We used these values to calculate *continuous abstinence* for the first 24 hours and 7 days (0 = smoked, 1 = abstinent), and the full 21 days (0 = smoked >5 cigarettes, 1 = smoked ≤5 cigarettes)[17] of the EMA phase. We also calculated *point-prevalence abstinence* at follow-up for the final 7 days and final 24 hours of the EMA phase (0 = smoked, 1 = abstinent).[19] Finally, we used participants' *expelled breath CO readings* at follow-up as a biochemical assessment of recent smoking (range = 1–52).

Data Analysis

We conducted two separate sets of analyses to examine the impact of Quitters' and Partners' cannabis use on smoking outcomes. The

first set of analyses used baseline reports of cannabis use to predict final smoking outcomes. The second set of analyses used daily reports of cannabis use to predict daily smoking. We provide detailed information below.

Results

Descriptive Statistics

Quitters averaged 35.69 (SD = 8.79) years of age and 13.28 (SD = 1.76) years of education. Most Quitters (n = 46, 74%) were white. Partners averaged 34.97 (SD = 9.06) years of age and 14.49 (SD = 2.14) years of education. Most Partners (n = 51, 84%) were also white. Just over half of the couples were married (n = 37, 60%; vs. cohabiting).

Quitters averaged 4.05 (SD = 2.45, range = 0–9) on cigarette dependence, which places the sample in the low dependence range.[18] Most Quitters smoked in the first (n = 57, 92%) and final (n = 52, 84%) 7 days of the EMA. Only 12 (19%) Quitters achieved 21-day continuous abstinence (≤5 cigarettes). At follow-up, 60% of Quitters scored a 10 or higher on their CO reading.

Prospective Analyses

We used baseline assessments of Quitters' and Partners' past-year cannabis use to predict Quitters' final smoking cessation outcomes. We used logistic regression to model our dichotomous outcomes (continuous abstinence and point-prevalence abstinence). We used negative binomial regression to model expelled breath CO as a count variable. We centered all continuous predictor variables at the mean, and we left dichotomous predictor variables uncentered. To account for missing data on cigarette dependence (n = 6), baseline Quitter cannabis use (n = 1), baseline Partner cannabis use (n = 1), and follow-up CO (n = 4), we conducted full-information maximum likelihood estimation using Mplus.

Results are presented in Table 1. After controlling for baseline covariates, Quitter past-year cannabis use emerged as a (trending) predictor of 7-day point-prevalence abstinence (p = .063). Using cannabis in the past year was associated with a 70% decrease in the odds of remaining abstinent during the final 7 days of the EMA. Quitters' cannabis use was not associated with any other smoking outcomes. Partners' cannabis use was not associated with Quitter smoking outcomes.

Daily Diary Analyses

We used Quitters' and Partners' daily cannabis use to predict Quitters' smoking, both that day and on the following day, using multilevel generalized linear models in Stata 14. For smoking (no/yes), we used a binomial distribution with a logit link. For cigarette quantity, we used a negative binomial distribution with a log link. We centered all continuous predictor variables at the grand mean and left dichotomous predictors uncentered.

Results are presented in Table 2. As expected, when Quitters reported using cannabis, they were more likely to smoke that day and the following day. However, the associations between Quitter cannabis use and number of cigarettes smoked were not significant. There were also no significant between-participant effects of Quitter daily cannabis use.

Partner cannabis use was not associated with Quitters' same-day smoking but was positively associated with Quitters' next-day smoking. Quitters also smoked more cigarettes that day and the following day. Furthermore, there were significant between-person (ie, Level 2) effects of Partner cannabis use. Quitters whose Partners used cannabis more frequently during the EMA were more likely to smoke and smoked a greater number of cigarettes on a given day.

Discussion

The current paper focuses on cannabis use as a risk factor for poorer smoking outcomes. Whereas past studies have focused on smokers enrolled in clinical trials,[8,9] we focused on smokers making a self-guided quit attempt. We found very limited evidence to

Table 1. Results of Prospective Analyses Examining Past-Year Cannabis Use as a Predictor of Smoking Outcomes

	7-Day CA[a,b]		21-Day CA		7-Day PP[c]		Expelled breath CO	
	OR	95% CI	OR	95% CI	OR	95% CI	RR	95% CI
Intercept	0.16**	[0.05, 0.54]	4.71**	[1.97, 11.29]	3.02+	[1.07, 8.52]	14.86***	[11.37, 19.41]
Baseline CO	—	—	—	—	—	—	1.10**	[1.04, 1.15]
Cigarette dependence	0.94	[0.60, 1.47]	0.84	[0.67, 1.05]	1.00	[0.78, 1.29]	1.12**	[1.05, 1.19]
Age	0.99	[0.88, 1.12]	1.03	[0.96, 1.10]	0.95	[0.87, 1.03]	1.01	[0.99, 1.02]
Race	1.42	[0.44, 4.65]	0.92	[0.29, 2.92]	2.17	[0.62, 7.59]	1.11	[0.83, 1.48]
Education	1.01	[0.60, 1.67]	0.91	[0.63, 1.30]	0.96	[0.66, 1.40]	0.97	[0.90, 1.04]
Marital status	1.25	[0.38, 4.09]	1.54	[0.53, 4.45]	0.30	[0.08, 1.08]	0.84	[0.61, 1.17]
Quitter cannabis use	0.16	[0.01, 1.80]	0.81	[0.26, 2.49]	0.30+	[0.10, 0.87]	0.81	[0.58, 1.12]
Partner cannabis use	0.64	[0.19, 2.18]	1.05	[0.26, 4.20]	1.47	[0.38, 5.74]	1.26	[0.93, 1.69]

Data were analyzed using logistic and negative binomial regressions. Baseline CO, cigarette dependence, age, and education were treated as continuous variables and centered at the mean. Race (0 = white, 1 = nonwhite), marital status (0 = married, 1 = cohabiting), and cannabis use (0 = no past-year use, 1 = past-year use) were left uncentered. The intercept can therefore be interpreted as the probability of smoking (CA and PP) or typical CO in ppm for a white, married, non-cannabis-using individual of average baseline CO, cigarette dependence, age, and education. CA = continuous abstinence; PP = point prevalence; CO = carbon monoxide; OR = odds ratio; RR = risk ratio; 95% CI = 95% confidence interval. N = 62.

[a]Given the relatively small sample size and some issues with sparse data bias, the analyses for 7-day continuous abstinence were conducted using penalized estimation.[20] We used conservative 95% prior limits on the odds ratio scale of [0.25, 4.00]. The penalized variables were race, marital status, and partner cannabis use.

[b]Results for 24-hour continuous abstinence (not presented) were similar, but weaker.

[c]Results for 24-hour point-prevalence abstinence (not presented) were similar, but weaker.

+p < .10.

**p < .01.

***p < .001.

Table 2. Results of Daily Diary Analyses Examining Daily Cannabis Use as a Predictor of Smoking and Number of Cigarettes

	Smoked		No. of cigarettes	
Predictor	OR	95% CI	RR	95% CI
Intercept	2.10+	[0.88, 5.03]	0.89	[0.57, 1.41]
Past-day DV (t – 1)	2.15*	[1.16, 3.97]	1.02**	[1.01, 1.04]
Day of study (GMC)	0.95+	[0.91, 1.00]	0.98+	[0.97, 1.00]
Quitter total cannabis use (GMC)	0.93	[0.81, 1.07]	1.01	[0.93, 1.10]
Quitter same-day cannabis use (t)	3.30**	[1.57, 6.93]	1.08	[0.74, 1.57]
Quitter past-day cannabis use (t – 1)	2.70*	[1.02, 7.21]	1.14	[0.89, 1.46]
Partner total cannabis use (GMC)	1.56**	[1.20, 2.04]	1.09*	[1.02, 1.17]
Partner same-day cannabis use (t)	1.62	[0.18, 14.65]	1.47*	[1.09, 1.98]
Partner past-day cannabis use (t – 1)	0.06**	[0.01, 0.36]	0.67***	[0.53, 0.84]

Data were analyzed using multilevel generalized linear models (melogit and menbreg in Stata 14). Smoked (no/yes) was analyzed using a binomial regression with a logistic link, and No. of cigarettes was analyzed using a negative binomial regression with a log link. Past-day DV (t – 1) refers to the lagged dependent variable, included to control for autocorrelation. Day of the study was included to control for unmeasured temporal confounds; it was originally coded 1–22, but was grand mean centered for analyses. Total cannabis use (ie, the total number of cannabis-using days during the EMA) was included to control for between-person effects of cannabis use; it was originally coded 0–22 but was grand mean centered for analyses. Same-day cannabis use was coded 0 = did not use cannabis, 1 = did use cannabis. Past-day cannabis use (t – 1) refers to lagged cannabis use, included to examine the effects of cannabis use on next-day smoking outcomes. No. of cigarettes = number of cigarettes; OR = odds ratio; RR = risk ratio; 95% CI = 95% confidence interval; GMC = grand-mean centered; EMA = ecological momentary assessment. Total person-days (Level 1) = 760. Total participants (Level 2) = 62.

+$p < .10$.

*$p < .05$.

**$p < .01$.

***$p < .001$.

support past-year cannabis use as a predictor of smoking outcomes. However, Quitter and Partner cannabis use during the EMA were associated with greater smoking.

There are at least three limitations to the current study. First, the data were from a study that was not designed to test the current research question. Second, these data were taken from a study with a relatively small sample size, so our analyses may have been underpowered. Third, we did not have a frequent or heavy cannabis-using sample. Although over half of our sample reported some cannabis use in the past year, only 16 Quitters and seven Partners reported using cannabis during the EMA. Cannabis use might differentially impact smoking outcomes for casual versus heavy users, but we were unable to test this possibility in the current study.

We did not find strong support for past-year cannabis use as a risk factor for poorer smoking outcomes; other individual difference characteristics might be more central to achieving abstinence during a self-guided quit attempt. However, both Quitters' and Partners' cannabis use were associated with smoking and number of cigarettes during the EMA. This suggests that cannabis use plays an important role in the day-to-day lives of smokers. Furthermore, Partners' cannabis use was a more potent predictor than Quitters' cannabis use during the EMA, consistent with cannabis use serving as a smoking cue.[13,14] Taken together, these findings suggest that smoking cessation programs might increase efficacy by targeting on-going cannabis use behaviors. Furthermore, it is imperative to consider the romantic partner; smoking cessation programs that fail to take a couples-oriented approach to treatment would probably be less efficacious for coupled smokers, regardless of the smoking status of the partner.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at https://academic.oup.com/ntr.

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Declaration of Interests

None declared.

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