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Motivation to Quit Using Cannabis Was Associated with Lower Cannabis Use Among Pregnant Women at Risk for Sexually Transmitted Infections

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Abstract

Background: Cannabis is one of the most common substances used during pregnancy. This study examined motivation to quit cannabis use among pregnant women enrolled in a randomized controlled trial of a technology-delivered brief motivational intervention targeting sexually transmitted infection (STI) risk behaviors, including substance use.

Methods: Secondary analyses used data from a clinical trial among pregnant adults who screened positive for STI risk behavior (e.g., sexual behavior and alcohol/drug use risk during pregnancy). Four subscales (autonomous, introjected, external, and amotivation) from the Treatment Self-Regulation Questionnaire assessed motivation for not using cannabis and the timeline follow-back assessed cannabis use at baseline, 2-month, and 6-month follow-up during pregnancy. Mixed logistic regression and negative binomial regression investigated the relationship between motivation and cannabis use (Y/N) and cannabis use days, respectively, with a generalized estimating equations approach after adjusting for age and marital status.

Results: Of 176 participants (mean age: 30.2 [standard deviation = 5.0]; 26% Black), $n = 62$ (35.2%) reported cannabis use during pregnancy. Participants with cannabis use during pregnancy were more likely to be younger, Black, and have lower socioeconomic status than those with no cannabis use. Higher autonomous, introjected, and amotivation scores were associated with lower odds of cannabis use ($p = 0.0003$, $p = 0.0033$, $p = 0.0307$, respectively). Higher autonomous, introjected, and external regulation scores were associated with fewer average cannabis use days ($p = 0.0013$, $p = 0.0035$, $p = 0.005$, respectively).

Conclusions: Higher levels of motivation are associated with less cannabis use during pregnancy. Given psychosocial barriers to treatment, these findings may support delivery of brief technology-delivered motivational interventions to reduce prenatal cannabis use.

Keywords: motivation; cannabis; TSRQ; pregnant; women

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Introduction

Cannabis is one of the most common substances used during pregnancy and prenatal use continues to increase.¹ Nationally, 7% of pregnant people self-report current cannabis use.² States where recreational cannabis use is legal report higher rates of use during pregnancy.³ In Michigan, based on self-report and urine toxicology, prenatal cannabis was identified in nearly 17% of pregnancies.⁴

Rigorous studies have identified adverse consequences for infants exposed to cannabis *in utero* including small for gestational age and low birth weight^{5,6} as well as adverse maternal health outcomes such as gestational hypertension and preeclampsia.⁷ Despite the American College of Obstetricians & Gynecologists' recommendation that health care professionals advise cannabis cessation during pregnancy,⁸ many pregnant people perceive little to no risk of harm from cannabis use and often cite it as helpful for common pregnancy symptoms such as nausea, insomnia, and anxiety.^{9,10} Conversely, concerns about the effects of cannabis on baby and pregnancy have been shown to be a significant predictor of cannabis abstinence during pregnancy.¹⁰

Motivational interviewing (MI), a collaborative and nonjudgmental approach to behavior change, is one of the evidence-based brief interventions shown to be helpful for prenatal cannabis use reduction and cessation.¹¹ One of the core processes in MI is eliciting a person's own reasons for change, also known as evoking "change talk."¹² While motivations for prenatal cannabis use have been explored in prior research, there is a dearth of literature exploring reasons to reduce or stop prenatal cannabis use.

The self-determination theory (SDT) has been used as a framework to understand motivation for substance use-related health behaviors including tobacco cessation and responsible alcohol and cannabis use.^{13–15} According to SDT, motivation is a multidimensional construct in which multiple types of motivation exist on a continuum of self-determination.¹⁶ Generally, the more self-determined types of motivation have been more strongly and positively associated with positive health behaviors (*e.g.*, responsible cannabis use).¹⁵

To our knowledge, no published studies have used the SDT framework to examine the relationship between motivation and cannabis use during pregnancy. Therefore, the current study sought to address this gap in the literature by examining the

relationship between different types of motivation to not use cannabis and cannabis use among pregnant women in Michigan enrolled in a randomized controlled trial of a technology-delivered brief motivational intervention targeting sexually transmitted infection (STI) risk behaviors including substance use.

Methods

Design

The current study used data from a randomized controlled trial of the Health Check-up for Expectant Moms, a technology-delivered brief motivational intervention targeting the reduction of behaviors associated with risk of STIs (*e.g.*, condomless sex, multiple partners, and alcohol/drug use) during pregnancy. Study methods have been described previously.^{17–19} Individuals were eligible for participation if they met the following criteria: (1) pregnant women (≤ 21 weeks gestation), (2) at least 18 years of age, (3) screened positive for STI risk behavior, and (4) proficient in English. Individuals were excluded if they were currently in substance use treatment. All participants provided informed consent. The University of Michigan Medical School Institutional Review Board approved all study procedures. The trial is registered at ClinicalTrials.gov (NCT03826342).

Measures

For the current study, data from assessments administered at baseline, 2-month, and 6-month follow-up during pregnancy were included in analyses. Participants self-reported demographic variables on the baseline assessment including age, race, ethnicity, education, employment status, number of children, receipt of public assistance, number of weeks gestation (pregnancy weeks), and marital status.

The 15-item Treatment Self-Regulation Questionnaire (TSRQ) assessed four domains of motivation for not using cannabis at baseline, 2-month, and 6-month follow-up.²⁰ The four domains in the TSRQ include (1) autonomous motivation—engaging in behavior because one values and/or associates a sense of self with the behavior (most self-determined); (2) introjected regulation—engaging in behavior to avoid negative affect (*e.g.*, shame and guilt) or feel positive affect (*e.g.*, pride) related to internalized external expectations; (3) external regulation—engaging in behavior due to external punishment or reward; and (4) amotivation—a lack of intent to act (least self-determined).^{16,21} Each TSRQ

item began with the following prompt: "The reason I would not use cannabis during pregnancy is..." and participants indicated the extent to which each item was true (1 = not at all true to 7 = very true). One item ("because others would be upset with me if I smoked") was excluded from analyses as it was previously identified to load on multiple motivation domains.²⁰ The following pregnancy-specific item was added to the autonomous motivation subscale: "...because I personally believe it is the best thing for my baby's health." Mean subscale scores were calculated for each of the four domains (mean range 1–7). Specific TSRQ items are available in Supplementary Table S1. Cronbach's alpha coefficients in the current sample were extremely high for all subscales (autonomous motivation [$\alpha = 0.99996$], introjected regulation [$\alpha = 0.99988$], external regulation [$\alpha = 0.99987$], and amotivation [$\alpha = 0.99960$]).

Timeline follow-back (TLFB) administered at baseline (past 90 days), 2-month (past 42–94 days), and 6-month (past 54–139 days) follow-up assessed cannabis use starting the day after the previous assessment. Primary outcomes were any cannabis use (yes/no) and days of cannabis use reported on any of the prenatal TLFB assessments. Because women could enroll in the study any time during pregnancy up to 21 weeks gestation, it is possible that for some women, the 90-day baseline TLFB data included prepregnancy and pregnancy. For that reason, in addition to the primary outcomes, we also report the number of women who endorsed cannabis use when limiting the TLFB timeframe to 1 month prior to baseline and/or follow-up assessments.

Data analysis

Baseline demographic variables were compared between those who reported cannabis use and those who did not using two-tailed *t* tests, Wilcoxon rank sum tests, or chi-square tests, as appropriate. Relationship between cannabis use and type of motivation (autonomous, introjected, external, and amotivation) was investigated using a mixed logistic regression for cannabis use (Y/N) and a negative binomial regression for cannabis use days, with a generalized estimating equation approach after adjusting for age and marital status. Several sociodemographic variables differed significantly by cannabis use: age, education, employment, race, marital status, receive public assistance, and pregnancy weeks. Age was included in the final model due

to a significant difference between the two study arms, and its clinical relevance as a potential confounder. Education, employment, race, marital status, and public assistance were highly correlated. Marital status differed significantly between the two study arms (intervention vs. control) and so was selected for the final model. Pregnancy weeks were excluded from the final model due to convergence issues.

Results

On average, participants ($N = 176$) were 30.2 (standard deviation [SD] = 5.0) years of age in the early second trimester of pregnancy and primarily identified as non-Latina (90%), White (64%), and Black (26%) (Table 1). The majority of participants were married (54%), employed (72%), had at least some college education (76%), and had one or more children (58%).

Over one-third (35.2%) reported cannabis use at least once on TLFB assessments during pregnancy. Among those who used cannabis, average days of prenatal use during the study period were 34 (SD = 33). Those who used cannabis were more likely to be younger, Black, single, have a high school education, be unemployed or working in the home, and receiving public assistance (all $p < 0.0001$; Table 1). Approximately two-thirds of pregnant participants who used cannabis reported a desire to cut back (46.2%) or stop (16.9%) cannabis use at baseline. Of note, when we limited those who used cannabis to baseline past month TLFB and/or either follow-up to help ensure we only captured prenatal cannabis use, fewer women [$n = 20$ (11.4%)] reported cannabis use.

Overall, average scores on the autonomous motivation and introjected regulation subscales were on the higher end of the 1–7 range, while the external regulation and amotivation tended to be on the lower end of the range across all assessment timepoints (Table 2). Mean autonomous motivation and introjected regulation scores were significantly lower among those with cannabis use compared with those without cannabis use at baseline, 2-month, and 6-month follow-up (Table 2).

Table 3 summarizes the mixed logistic regression and negative binomial regression for cannabis use outcomes during pregnancy. When controlling for age and marital status, higher autonomous motivation ($p = 0.0003$), introjected regulation ($p = 0.0033$), and amotivation ($p = 0.0307$) were associated with lower odds of cannabis use during pregnancy. Additionally, when

Table 1. Baseline Demographic Variables for Pregnant Participants at Risk for Sexually Transmitted Infection During Pregnancy by Cannabis Use Status

Demographics	All N = 176	Cannabis use N = 62	No cannabis use N = 114	p ^a
Age, mean (SD)	30.2 (5.0)	28.2 (5.2)	31.2 (4.6)	0.0001
Education, n (%)				<0.0001
Didn't graduate high school	11 (6)	7 (11)	4 (4)	
High school graduate or GED	23 (13)	16 (26)	7 (6)	
Went to technical/trade school	8 (5)	4 (6)	4 (4)	
Some college	33 (19)	19 (31)	14 (12)	
College graduate	49 (28)	9 (15)	40 (35)	
Postgraduate	52 (30)	7 (11)	45 (39)	
Employment status, n (%)				<0.0001
Full time	99 (56)	24 (39)	75 (66)	
Part time	27 (15)	5 (8)	22 (19)	
Student	5 (3)	5 (8)	0 (0)	
Stay-at-home mom	22 (13)	11 (18)	11 (10)	
Unemployed	23 (13)	17 (27)	6 (5)	
#Children, n (%)				0.20
0	74 (42)	21 (34)	53 (46)	
1	54 (31)	19 (31)	35 (31)	
2	28 (16)	11 (18)	17 (15)	
3	11 (6)	7 (11)	4 (4)	
4 or more	9 (5)	4 (6)	5 (4)	
Receive public assistance, n (%)				<0.0001
Yes	56 (32)	38 (61)	18 (16)	
No	120 (68)	24 (39)	96 (84)	
Pregnancy weeks				0.01
Mean (SD)	13.8 (4.4)	12.8 (4.4)	14.3 (4.4)	
Median (IQR)	14 (10, 17)	12 (9, 15)	14 (11, 18)	
Race, n (%)				<0.0001
White	112 (64)	23 (37)	89 (78)	
Black	45 (26)	29 (47)	16 (14)	
Asian	4 (2)	0 (0)	4 (4)	
Native American or Native Alaskan	1 (1)	1 (2)	0 (0)	
Multiracial	7 (4)	5 (8)	2 (2)	
Other	7 (4)	4 (6)	3 (3)	
Ethnicity, n (%)				0.6
Latina	17 (10)	7 (11)	10 (9)	
Non-Latina	159 (90)	55 (89)	104 (91)	
Current marital status, n (%)				<0.0001
Single–never married	41 (23)	29 (47)	12 (11)	
Living together but not married	33 (19)	15 (24)	18 (16)	
Legally married	95 (54)	13 (21)	82 (72)	
Separated	2 (1)	1 (2)	1 (1)	
Divorced	4 (2)	3 (5)	1 (1)	
Widowed	1 (1)	1 (2)	0 (0)	

Boldface indicates significance at $p < 0.05$.

^aDifferences by cannabis use using two-tailed t tests, Wilcoxon rank sum tests, or chi-square tests, as appropriate.

IQR, interquartile range; SD, standard deviation.

controlling for age and marital status, higher autonomous motivation ($p = 0.0013$), introjected regulation ($p = 0.0035$), and external regulation ($p = 0.005$) were associated with fewer days of cannabis use during pregnancy.

Discussion

The current study examined the relationship between different types of motivation to not use cannabis during pregnancy and cannabis use among pregnant

women enrolled in a randomized controlled trial of a technology-delivered brief motivational intervention targeting STI risk behaviors including substance use. More than one in three women reported cannabis use on prenatal assessments. Overall, higher levels of more self-determined motivation were associated with less cannabis use during pregnancy.

Cannabis use during pregnancy is commonly self-reported (7%) in the United States.² For Michigan, a

Table 2. Mean Treatment Self-Regulation Questionnaire Scores at Baseline, 2-Month, and 6-Month Follow-Up for Pregnant Participants at Risk for Sexually Transmitted Infection During Pregnancy by Cannabis Use Status

Assessment	TSRQ subscales	All	Cannabis use	No cannabis use	<i>p</i> ^a
Baseline	Autonomous motivation	5.98 (1.55)	5.46 (1.92)	6.26 (1.23)	0.0256
	Introjected regulation	5.37 (2.16)	4.68 (2.49)	5.75 (1.86)	0.0247
	External regulation	2.19 (1.55)	2.33 (1.63)	2.11 (1.51)	0.2943
	Amotivation	2.77 (1.85)	2.78 (2.03)	2.77 (1.74)	0.7188
2 months	Autonomous motivation	6.12 (1.28)	4.98 (1.86)	6.29 (1.07)	0.0005
	Introjected regulation	5.64 (1.92)	4.11 (2.31)	5.88 (1.75)	0.0006
	External regulation	2.60 (1.73)	3.01 (1.73)	2.54 (1.72)	0.1549
	Amotivation	2.91 (1.76)	2.61 (1.75)	2.96 (1.76)	0.3212
6 months	Autonomous motivation	6.11 (1.35)	4.29 (1.86)	6.23 (1.24)	0.0023
	Introjected regulation	5.39 (2.16)	2.75 (2.60)	5.57 (2.02)	0.0116
	External regulation	2.37 (1.48)	1.63 (1.00)	2.42 (1.50)	0.1333
	Amotivation	3.01 (1.71)	3.08 (1.96)	3.00 (1.71)	0.9259

Boldface indicates significance at *p* < 0.05.

^aDifferences by cannabis use using Wilcoxon rank sum tests.

TSRQ, Treatment Self-Regulation Questionnaire.

state with legalized recreational cannabis, the prevalence of prenatal cannabis use is much higher, 17%.⁴ Notably, the rates of cannabis use reported during pregnancy in the current study were double (37%) the Michigan state-wide prevalence. However, notably, when restricting the

baseline TLFB assessment to only include the past month, the prevalence of cannabis use during pregnancy was much lower (11%). While higher frequency of cannabis use prior to pregnancy is associated with higher risk of prenatal cannabis use,²² many women

Table 3. Mixed Logistic Regression for Cannabis Use (Y/N) and a Negative Binomial Regression for Days of Cannabis Use Findings by Motivation Subscale for Pregnant Participants at Risk for Sexually Transmitted Infection During Pregnancy

Parameter	Any cannabis use ^a		Days of cannabis use ^b	
	AOR (95% CI)	<i>p</i>	IRR (95% CI)	<i>p</i> Value
Autonomous motivation subscale				
Age	0.94 (0.88, 0.99)	0.0328	0.89 (0.76, 1.03)	0.1138
Marital status				
Legally married	Reference		Reference	
Living together but not married	4.50 (1.90, 10.65)	0.0006	4.70 (1.63, 13.59)	0.0042
Single–never married/separated/divorced/widowed	8.42 (4, 17.69)	<0.0001	8.53 (2.95, 24.62)	<0.0001
Time-varying autonomous motivation	0.70 (0.58, 0.85)	0.0003	0.63 (0.47, 0.83)	0.0013
Introjected regulation subscale				
Age	0.93 (0.88, 0.99)	0.0154	0.88 (0.77, 1)	0.0569
Marital status				
Legally married	Reference		Reference	
Living together but not married	4.95 (2.17, 11.26)	0.0001	3.68 (1.42, 9.54)	0.0072
Single–never married/separated/divorced/widowed	7.94 (3.72, 16.95)	<0.0001	6.06 (2.44, 15.04)	0.0001
Time-varying introjected regulation	0.82 (0.71, 0.93)	0.0033	0.74 (0.61, 0.91)	0.0035
External regulation subscale				
Age	0.94 (0.88, 0.99)	0.0252	0.86 (0.76, 0.98)	0.0209
Marital status				
Legally married	Reference		Reference	
Living together but not married	5.88 (2.51, 13.81)	<0.0001	6.70 (2.03, 22.15)	0.0018
Single–never married/separated/divorced/widowed	10.50 (4.94, 22.32)	<0.0001	13.37 (4.64, 38.51)	<0.0001
Time-varying external regulation	0.91 (0.76, 1.09)	0.2881	0.75 (0.61, 0.92)	0.005
Amotivation subscale				
Age	0.94 (0.89, 1)	0.0369	0.90 (0.79, 1.02)	0.1067
Marital status				
Legally married	Reference		Reference	
Living together but not married	6.24 (2.70, 14.44)	<0.0001	5.43 (1.53, 19.25)	0.0088
Single–never married/separated/divorced/widowed	11.84 (5.58, 25.12)	<0.0001	15.18 (5.10, 45.20)	<0.0001
Time-varying amotivation	0.83 (0.71, 0.98)	0.0307	0.76 (0.56, 1.02)	0.0662

Boldface indicates significance at *p* < 0.05.

^aModel 1: Mixed logistic regression model for any cannabis use during pregnancy (yes/no), using log duration as offset.

^bModel 2: Mixed negative binomial regression model for days of cannabis use, using log duration as offset.

who use cannabis achieve abstinence during pregnancy.²³ Nonetheless, the high rates of cannabis use among this sample of pregnant women at risk for STIs highlight the importance and potential impact of cannabis cessation interventions tailored for this uniquely at-risk group.

Consistent with previous studies of substance use-related health behaviors, we found that the more self-determined types of motivation were more strongly associated with less prenatal cannabis use compared with less self-determined types of motivation.^{14,20} Specifically, autonomous motivation was most strongly associated with lower odds of cannabis use as well as fewer days of cannabis use during pregnancy. To date, we only know of one other study that examined autonomous motivation for substance use-related health behaviors during pregnancy, and the author found that an MI intervention increased autonomous motivation to reduce alcohol use.²⁴ Taken together, these findings provide support for motivational interventions, such as MI, to increase autonomous motivation and reduce prenatal cannabis use. Brief technology-delivered motivational interventions, such as the one used in the parent study targeting the reduction of behaviors associated with risk of STIs, may be particularly well suited for highly stigmatized behaviors in at-risk groups.

Similar to autonomous motivation, higher introjected regulation was associated with less cannabis use. While this finding is consistent with the literature, it is notable that the introjected regulation items on the TSRQ only assess for behavior to avoid negative affect (*e.g.*, shame and guilt) related to internalized external expectations and do not include any items to assess for engaging in behavior to feel positive affect (*e.g.*, pride).²⁰ Pregnant people who use substances, including cannabis, face pervasive stigma.²⁵ The majority of people with prenatal cannabis use report they would not disclose use to their medical provider due to mistrust and fear of negative consequences such as child welfare involvement.^{26,27} More research is needed to better understand the impact of introjected regulation on relationships with health care providers and mental health outcomes among pregnant people who use cannabis.

Higher external regulation was associated with fewer days of cannabis use during pregnancy. For most pregnant people, the perinatal period involves many complex decisions, often while navigating

societal expectations and multiple interpersonal influences, including medical providers, partners, family, and friends. A recent study found that among people who used prenatal cannabis to treat nausea and vomiting, feedback about their use was primarily negative from medical providers and primarily positive from friends, family, and partners, which often informed their decision to continue use.²⁸ Using a nonjudgmental, risk-reduction lens can facilitate informed decision-making among pregnant people.²⁹ Furthermore, prioritizing patient-centered care and shared decision-making may help improve patient-provider communication about stigmatized topics such as the risks and benefits of prenatal cannabis use, as well as risky sexual behaviors.^{30,31}

Different from previous studies, we found that amotivation was associated with lower odds of cannabis use, although the association was weaker than the more self-determined forms of motivation. In the one previous study using the TSRQ to assess the association between motivation and cannabis use among college students with past month cannabis use, authors found amotivation was associated with more severe cannabis use.¹⁵ The current study differed from previous research because it included both women who reported and did not report cannabis use during pregnancy. It is probable that women who did not use cannabis currently or in the recent past may have endorsed higher levels of amotivation about cannabis because they did not find it relevant (*e.g.*, “I really don’t think about it.”). Future research should prospectively recruit women using cannabis during pregnancy to assess how different types of motivation influence changes in use across trimesters and the postpartum period.

Limitations

Generalizability of findings is limited as our sample included cisgender women who were at increased risk of STI during pregnancy, based on specific behaviors, and who were recruited in Michigan, a state with legalized recreational cannabis. While the study sample may limit generalizability of our results to other pregnant women who use cannabis during pregnancy, the use of substances, such as cannabis, can increase the probability of engaging in sexual risk behavior through disinhibition and impairment of judgment. Therefore, the study sample may not be inherently different from the broader population of people who

use cannabis prenatally.^{32,33} Additionally, we asked participants to recall and self-report sensitive health behaviors, so the results may have been influenced by recall and social desirability bias; however, digitally delivered surveys have been shown to help facilitate disclosure of stigmatized behavior.³⁴ Moreover, we did not include biological measures of cannabis use. Lastly, baseline cannabis use assessed by the TLFB included both prepregnancy and pregnancy use, as our study did not formally assess when participants became aware of their pregnancy.

Conclusion

Among pregnant women at increased risk of STI during pregnancy, higher levels of motivation are associated with less prenatal cannabis use. Given psychosocial barriers to treatment, including stigma, these findings may support delivery of brief technology-delivered motivational interventions to reduce cannabis use during pregnancy. Future work incorporating the TSRQ into motivational intervention studies is needed to better understand how such interventions may impact the relationship between levels of motivation and outcomes.

Authors' Contributions

A.B.P.-A.: Conceptualization, methodology, writing—original draft, and writing—review and editing. B.M.: Conceptualization, methodology, and writing—review and editing. A.S.: Data curation, formal analysis, funding acquisition, and writing—review and editing. D.C.: Data curation, formal analysis, and writing—review and editing. K.C.: Project administration, data curation, and writing—review and editing. C.Z.: Writing—review and editing, funding acquisition, and supervision. G.T.W.: Conceptualization, project administration, methodology, writing—review and editing, funding acquisition, resources, and supervision.

Data Availability

Study participants were not asked and were not consented to have their data publicly available. Deidentified data reported in this manuscript are available by request to the senior author.

Author Disclosure Statement

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Supplementary Material

Supplementary Table S1

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Abbreviations Used

MI = motivational interviewin
SD = standard deviation
SDT = self-determination theory
STI = sexually transmitted infection
TLFB = Timeline follow-back
TSRQ = Treatment self-regulation questionnaire

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