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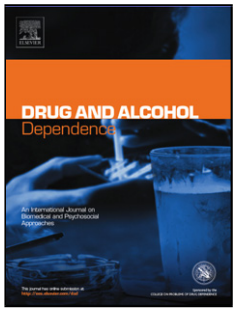

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SOCIAL COGNITIVE PREDICTORS OF TREATMENT OUTCOME IN CANNABIS DEPENDENCE

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Highlights

- Expectancies and self-efficacy are key cognitive constructs in cannabis dependence
- First study to measure both constructs as treatment outcome predictors
- Emotional relief refusal self-efficacy was robust predictor of treatment outcome
- Negative cannabis expectancy predicted lower likelihood of lapse
- Self-efficacy may mediate risk conveyed by positive cannabis expectancy

ABSTRACT

Background: Drug-related outcomes expectancies and refusal self-efficacy are core components of Social Cognitive Theory. Both predict treatment outcome in alcohol use disorders. Few studies have reported expectancies and refusal self-efficacy in cannabis dependence. None have examined both, although both constructs are key targets in Cognitive-Behavioural Therapy (CBT). This study tests the predictive role of expectancies and refusal self-efficacy in treatment outcome for cannabis dependence. **Design**: Outpatients completed a comprehensive assessment when commencing cannabis treatment and predictors of treatment outcome were tested. **Setting:** A university hospital alcohol and drug outpatient clinic. **Participants:** 221 cannabis-dependent patients participated in a 6-week CBT program where the goal was abstinence. **Measurements:** Cannabis Expectancy Questionnaire and Cannabis Refusal Self-Efficacy Questionnaire, cannabis dependence severity [Severity of Dependence Scale], psychological distress [General Health Questionnaire] at baseline; the timeline follow-back procedure at baseline and each session. **Findings**: Patients reporting lower confidence in their ability to resist cannabis during high negative affect (*emotional relief refusal self-efficacy*) had a lower likelihood of abstinence ($p = .004$), more days of use ($p < .001$), and larger amount used ($p < .001$). Negative cannabis expectancies predicted

greater likelihood of abstinence (p = .024). Higher positive expectancies were associated with lower emotional relief self-efficacy, mediating its association with outcome (p < .001). **Conclusions:** Emotional relief refusal self-efficacy and negative expectancies are predictive of better treatment outcomes for cannabis dependence. Positive expectancies may indirectly predict poorer outcome because of a negative association with self-efficacy, but this conclusion remains tentative as directionality could not be established.

Keywords: cannabis dependence, expectancies, self-efficacy, treatment, CBT

1. INTRODUCTION

Cannabis is the most widely used illicit drug with 2.8 to 4.5% of the adult global population estimated as cannabis users (Degenhardt and Hall, 2012). In the most recent Australian survey, lifetime prevalence of cannabis dependence is approximately 3% when using criteria from the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; Mewton et al., , 2013). Compared to the fifth edition, DSM-IV cannabis dependence is equivalent to moderate-to-severe cannabis use disorder (4+ criteria met; American Psychiatric Association, 2013). Cannabis dependence is associated with a wide variety of adverse physical and mental health consequences (Hall and Degenhardt, 2009; Hall and Pacula, 2003). No medications have been approved for the treatment of cannabis dependence (Justinova et al., 2013). Psychological therapies are the first line of treatment (Davis et al., 2015; Litt et al., 2008). Cognitive-behavioural therapy (CBT) is among the most effective (Babor and The Marijuana Treatment Project Research Group, 2004; Budney et al., 2006; Carroll et al., 2006; Hoch et al., 2014). Relapse rates remain high. Determining predictors of outcome is required to inform more effective treatment (McRae et al., 2003; Moore and Budney, 2003).

Social Cognitive Theory (SCT) emphasizes the importance of two domains of cognition in bringing about behaviour change, both of which can be affected by vicarious experience or modeling (Bandura, 1986). *Outcome expectancies* describe an individual's belief that a particular behaviour will produce certain outcomes (Bandura, 1977, 2001; Jones et al., 2001). According to SCT, expectancies about the effects of substance use play an important role in consumption, dependence, and treatment. Evidence links expectancies to all of these outcomes (Boden et al., 2013; Connor et al., 2007; Jones et al., 2001; Young et al., 2011). Expectancies have been shown to predict cannabis use and dependence (Connor et al., 2014). Positive cannabis expectancies are predicted to increase motivation to consume cannabis, and negative expectancies to decrease it (Connor et al., 2011).

Self-efficacy forms the second key component of SCT. Refusal (or abstinence) self-efficacy has received most research attention. This is belief in the ability to refuse an abused substance. Low refusal self-efficacy is hypothesised to undermine motivation for abstinence and predict poorer outcomes (Bandura, 1999; Oei and Baldwin, 1994). In their review, Kadden and Litt (2011) reported low refusal self-efficacy consistently predicted poorer post-treatment outcomes across substances. Self-efficacy for avoiding cannabis after completing treatment predicted cannabis use at 12 months over-and-above past consumption, peer use, temptation, and stress (Stephens et al., 1995). In a comparison of different psychological treatments for cannabis dependence, Litt and colleagues (2008) reported increases in refusal self-efficacy to be a primary common mechanism through which 12-month outcomes were achieved.

Most previous studies have employed *ad hoc* global measures of refusal or abstinence self-efficacy. Young et al. (2012) developed the Cannabis Refusal Self-Efficacy Questionnaire (CRSEQ), a theoretically-driven and psychometrically robust assessment of

self-efficacy. The measure assesses situational confidence to refuse cannabis consumption for emotional relief, social facilitation, and opportunistically. These subtypes of refusal self-efficacy may be differentially related to clinical outcomes. In a large sample of court-referred cannabis users, Young et al. reported all three subtypes were associated with lower consumption, but only high emotional relief self-efficacy was related to lower severity of cannabis dependence.

Despite evidence that both cognitive domains individually predict substance use outcomes (Boden et al., 2013; Connor et al., 2007; Jones et al., 2001; Kadden and Litt, 2011; Young et al., 2011), refusal self-efficacy and outcome expectancies have rarely been examined together, particularly in clinical populations. According to SCT, refusal self-efficacy should mediate the relationship between expectancies and treatment outcomes (Bandura, 1999; Oei and Baldwin, 1994). Those holding more positive (or less negative) beliefs about using cannabis should find it more difficult to refuse it in cued situations. Low refusal self-efficacy has been found to mediate the association between positive alcohol expectancies and problematic drinking in patients undergoing treatment, college students, and adolescents (Connor et al., 2011; Gullo et al., 2010). Given the significant correlation between the two, not including both expectancies and self-efficacy in predictive models could have obscured previous findings and the identification of priority targets for CBT (Connor et al., 2014).

Connor and colleagues (2014) investigated the combined role of expectancies and refusal self-efficacy in 1,115 cannabis users referred for assessment by the courts as an alternative to prosecution. In this cross-sectional study, refusal self-efficacy fully mediated the relationship between negative cannabis expectancies and weekly consumption. It partially mediated the effects of positive expectancies on weekly consumption. Expectancies and

refusal self-efficacy are also likely to be associated with treatment outcome. To date, no study has investigated the influence of both expectancies and refusal self-efficacy as predictors of treatment outcome in cannabis dependence.

The current study investigated the relationship between outcome expectancies, refusal self-efficacy and treatment outcome among cannabis-dependent outpatients. Outcomes of interest were cannabis abstinence, number of days of use, and amount used. The secondary aim of the study was to test the hypothesised mediational relationship between these constructs as outlined in SCT. According to SCT, refusal self-efficacy should mediate the relationship between expectancies and treatment outcomes. It was predicted that greater positive cannabis expectancies would be associated with lower refusal self-efficacy and, in turn, predict poorer treatment outcomes; fully mediating the relationship between expectancies and outcomes. A similar relationship was hypothesised for negative expectancies, refusal self-efficacy and treatment outcomes, but with lower negative expectancies being associated with lower self-efficacy and greater use.

2. METHOD

2.1. Participants and procedures

Data were obtained from 221 treatment-seeking cannabis users who presented to an outpatient alcohol and drug clinic at an Australian metropolitan public hospital. All patients attended treatment voluntarily. An initial intake assessment was conducted by a clinical nurse or social worker prior to referral to a cognitive-behavioural cannabis treatment program where the goal was abstinence. The program comprised five 1-hr sessions delivered over six weeks, with the final session taking place one fortnight after session four. The program was delivered one-on-one by Masters- or Doctoral-qualified clinical psychologists. It included CBT and elements of motivational enhancement; specifically, craving management, cognitive

restructuring, relapse prevention, and motivational interviewing. Patients were not excluded from program if they lapsed, so long as they maintained abstinence as their goal. Questionnaires assessing refusal self-efficacy, cannabis expectancies, severity of dependence and psychosocial functioning were completed at the first treatment session. Dependence severity and psychosocial functioning could impact treatment response and were included as potential covariates (Stephens et al., 1993; White et al., 2004). Abstinence, numbers of days used, and amount of cannabis used were recorded at each session. Therapists were not aware of study aims. Hospital and university human research ethics approval was obtained.

2.2. Measures

2.2.1 Cannabis Expectancy Questionnaire (CEQ; Connor et al., 2011). The 45-item CEQ assessed positive (18 items, e.g., 'Smoking cannabis makes me feel outgoing and friendly') and negative outcome expectancies (27 items, e.g., 'Smoking cannabis makes me confused'). Responses were rated on a 5-point Likert scale (1 = Strongly disagree to 5 = Strongly agree). Both subscales have excellent internal reliability ($\alpha = 0.89$ and 0.93 for negative and positive expectancies, respectively (Connor, Gullo, et al., 2011). The factor structure and criterion validity of the CEQ has been confirmed across two samples (Connor et al., 2011).

2.2.2. Cannabis Refusal Self-Efficacy Questionnaire (CRSEQ; Young et al., 2012). The 14-item CRSEQ measured levels of cannabis refusal self-efficacy. Responses were rated on a 6-point Likert scale (1 = *I am very sure I could NOT resist smoking* to 6 = *I am very sure I could resist smoking*. It comprises three subscales: *Emotional relief* (six items, e.g., 'When I feel sad'), *Opportunistic* (five items, e.g., 'When I am at a party'), and *Social facilitation* (three items, e.g., 'When I want to feel more accepted by friends'). The measure has good-to-excellent internal consistency ($\alpha = 0.97$, 0.91 and 0.84 for each subscale, respectively) and its factor structure and criterion validity has been previously established (Young et al., 2012).

2.2.3. Severity of Dependence Scale–Cannabis (SDS-C; Swift et al.,, 1998). This five-item scale assesses degree of cannabis dependence experienced by users (e.g., *Have you ever thought your cannabis use is out of control?*). Responses are rated on a 4-point Likert scale (0 = *Never* to 3 = *Always*). The SDS-C has good test-retest reliability and is sensitive to severity of cannabis dependence (Swift et al., 2000). Using Australian normative data, a score of ≥3 is indicative of DSM-IV cannabis dependence (Swift et al., 1998).

2.2.4. Cannabis consumption. The Timeline Followback (Sobell and Sobell, 1992) was used to measure session-by-session cannabis consumption and abstinence status. This retrospective, calendar-based assessment is one of the most psychometrically robust measures of daily substance use (Robinson et al., 2014). Outcomes of interest were abstinence status (0 = not abstinent, 1 = abstinent), number of days used, and total amount used (in grams).

2.2.5. Psychological distress. The Anxiety, Depression, and Somatic Symptoms scales of the General Health Questionnaire-28 (GHQ-28) were used to assess psychological distress (Goldberg and Williams, 1988). Items assess recent changes in perceived health and wellbeing (e.g., *Felt that life is not worth living*) and rated on a 4-point Likert-type scale (0 = *Not at all* to 3 = *Much more than usual*). It has strong psychometric properties (Goldberg et al., 1997; Goldberg and Williams, 1988; Werneke et al., 2000). Higher scores reflect poorer functioning.

2.3. Data analysis

Multi-level modelling (MLM) in *MLwiN* (version 2.30) was used to analyse the influence of expectancies and self-efficacy on treatment outcomes. MLM is particularly suited to analysing longitudinal clustered data; in this instance, sessions nested within patients (Hox, 2002). This is superior to analysing endpoint summary statistics, such as percentage days abstinent, as it allows for modelling of individual trajectories of change over

time. MLM is also suited to naturalistic settings where the number and frequency of sessions may vary across individuals. MLM utilises full information maximum likelihood (FIML) estimation, which are optimal for handling missing data (Graham, 2009), which is substantial in treatment studies. FIML produces less biased estimates than other missing data approaches, such as assuming relapse or carrying forward the last observation (Hallgren and Witkiewitz, 2013). Full iterative generalized least squares (IGLS) estimation, a type of FIML, was employed for days used and amount used models. Abstinence was analysed with generalized linear models utilising a logit link function and Taylor series expansion. In these models, coefficients represent logit transformed probabilities. To calculate effect size, they were converted to odds by finding the natural antilog (e^x). Assumptions of linearity and normality were assessed by examination of residuals. Baseline models included a random intercept (constant, β_{0j}), session number, and controlled for time (days) between sessions. Potential covariates were included (β_3 - β_{10}), but only retained if statistically significant:

$$\text{Abstinence/Days Used/Amount Used}_{ij} = \beta_{0j} + \beta_1 \text{ Time (days) between sessions}_{ij} + \beta_2 \text{ Session number}_j + \beta_3 \text{ High school completion:Yes}_j + \beta_4 \text{ Severity of cannabis dependence}_j + \beta_5 \text{Gender:Male}_j + \beta_6 \text{ Age}_j + \beta_7 \text{ Employment:Yes}_j + \beta_8 \text{ Somatic Symptoms}_j + \beta_9 \text{ Anxiety}_j + \beta_{10} \text{ Depression}_j + e_{ij.}$$

SCT predictors were added to the model on Step 2 (grand mean-centered), followed by SCT x session number interactions to investigate time-dependent effects. Predictors were tested for significance using the Wald test. Mediation was tested using the *joint significance procedure*, which is less prone to Type II error (MacKinnon et al., 2002) than the commonly-used 'causal steps' procedure (Baron and Kenny, 1986). There is support for mediation where there is a significant association between IV and mediator (path *a*) and a significant association between mediator and DV (path *b*). The primary MLM analyses test path *b* of

mediation. Because IV and mediator were measured once, standard multiple regression was implemented to test path *a* (expectancies→self-efficacy). Mediation effects were estimated with the product-of-coefficients method using the PRODCLIN software to calculate 95% confidence intervals (MacKinnon et al., 2007). When estimating mediation effects for the abstinence outcome variable (dichotomous), *a* and *b* path coefficients were first standardized using procedures outlined in MacKinnon and Dwyer (1993) to correct for differences in mediator/outcome distributions and variance of the residual.

3. RESULTS

3.1. Descriptive statistics and missing data

Nearly the entire sample was cannabis dependent (98.5%), with only three participants scoring below the ≥3 cut-off on SDS-C (Swift et al., 1998). The average number of sessions attended was three out of the total five, with 99 (44.8%) patients completing the treatment program. Of those, 66 (66.7%) had been abstinent for at least the past two weeks. Multi-level models are well equipped to account for missing values under most missing data conditions, especially for longitudinal designs (Graham, 2009; Tasca and Gallop, 2009), and Little's (1988) Missing Completely At Random (MCAR) test on baseline data was not significant, χ^2 (734) = 792.598, p = .066. Grand mean probability of abstinence was .68, 95%CIs [.608, .748]. Grand mean amount of cannabis consumed between sessions was 1.31 grams (*SD* = 4.09) and participants used the drug on 1.22 days between sessions (*SD* = 3.33). Sample descriptive statistics are reported in Table 1.

3.2. Abstinence

In the baseline model, no covariate was statistically significant and were omitted. Session number predicted abstinence, with probability of abstinence increasing over the course of treatment. Patients were 1.20 times more likely to be abstinent with each session,

95%CIs [1.003, 1.43]. When SCT variables were added to the model, higher negative expectancies at baseline predicted greater abstinence. A +1 *SD* increase in negative expectancies increased the odds of abstinence by 40.4%. Emotional relief refusal self-efficacy was also significant, with a +1 *SD* increase in self-efficacy associated with an increase in the odds of abstinence by 80%. SCT x session number interactions added on Step 3 were not significant (*p*s > .05) and not retained. Therefore, the slope of increase in abstinence over the course of treatment was not moderated by baseline expectancies or self-efficacy. The final model is summarised in Table 2.

3.3. Number of days cannabis used

In the baseline model, no covariate was statistically significant. Session number was significant, with patients reporting fewer days of cannabis use as treatment progressed. Significant effects of SCT variables were found. Emotional relief self-efficacy predicted fewer days of cannabis use during treatment (Table 3). SCT x session number interactions added on Step 3 were not significant and not retained (*p*s > .05). The final model is *summarised in Table 3.*

3.4. Amount of cannabis consumed

In the baseline model, no covariate was statistically significant. Session number was significant, with patients consuming, on average, 0.13 grams less cannabis per session. Significant effects of SCT variables were found. Emotional relief self-efficacy predicted a lower amount of cannabis use during treatment (Table 4). SCT x session number interactions added on Step 3 were not significant and not retained (*p*s > .05). The final model is summarised in Table 4.

3.5. Mediating role of refusal self-efficacy

Emotional relief refusal self-efficacy was the only domain of self-efficacy predictive of cannabis use during treatment. To investigate its role as a potential mediator of expectancy effects, a standard multiple regression was conducted. Overall, 11% of the variance in emotional relief refusal self-efficacy was accounted for by expectancies (path α), F (2,207) = 12.95, $p < .001$. Positive expectancies (β = -.33, $p < .001$) uniquely accounted for 10.5% of variance, but negative expectancies (β = -.12, $p = .072$) did not reach significance. Because positive expectancies were directly associated with emotional relief refusal self-efficacy (path *a*) and refusal self-efficacy predicted treatment outcome (path *b*), there was evidence for mediation according to the joint significance procedure. Furthermore, all mediation effects involving positive expectancies (predictor) and emotional relief refusal self-efficacy (mediator) estimated using the product-of-coefficients method were statistically significant (see Figure 1).

4. DISCUSSION

This is the first study to test the unique role of cannabis outcome expectancies and refusal self-efficacy in treatment outcome. Results show emotional relief refusal self-efficacy was a consistent predictor of improved outcomes in a 'real world' outpatient setting. There was also preliminary support for its role as a mediator of the effects of positive expectancies on outcome, as predicted by Social Cognitive Theory (SCT; Bandura, 1986). High negative expectancies had a direct, protective effect on probability of abstinence during treatment, but not number of days used or amount used during a lapse. Patients who attended more sessions showed greater improvements across all outcomes. Findings provide new insights for health professionals administering cognitive-behavioral therapy (CBT).

Findings support the critical role of self-efficacy in treatment, as predicted by SCT (Bandura, 1986; Connor et al., 2014; Oei and Baldwin, 1994). They are also in line with previous reports on the role of self-efficacy in substance use treatment outcome more broadly (Adamson et al., 2009; Kadden and Litt, 2011) and specifically in cannabis treatment outcome (Litt et al., 2008; Stephens et al., 1995). The current study sought to extend this literature by testing the unique contribution of three subtypes of refusal self-efficacy and, of those, only emotional relief refusal self-efficacy was related to treatment outcomes. Young et al. (2012) previously reported that while all subtypes of refusal self-efficacy were cross-sectionally related to weekly cannabis consumption, only emotional relief refusal self-efficacy was associated with severity of dependence. Copeland et al. (2001) reported stress relief was the most commonly cited reason for cannabis use in a sample of 229 treatment seekers. The current prospective study builds on these findings to show that only emotional relief refusal self-efficacy is predictive of cannabis use during CBT treatment where the goal is abstinence. According to SCT, with increased specificity self-efficacy becomes more predictive of subsequent behavior. Given this, targeting patients' confidence to refuse cannabis use to alleviate negative affect is likely to be more effective than improving self-efficacy more broadly. Considering the rate of treatment dropout, this may be an important early goal in treatment.

The regulation of negative affect is a primary motivator for breaching abstinence in cannabis dependence treatment. Similar results have been reported in the alcohol treatment literature (Cooney et al., 1997; Law et al., 2016; Miller et al., 1996). However, the early treatment context is important to consider here. Many patients report disposing of available cannabis and avoiding cannabis-using peers when commencing treatment, potentially reducing the impact of social facilitation and opportunistic refusal self-efficacy beliefs on

abstinence. It is possible that these other domains of self-efficacy play a greater role in longer-term abstinence and this requires further investigation. Nevertheless, the value in distinguishing between refusal self-efficacy subtypes is clear. These results suggest treatment should focus on building emotional relief refusal self-efficacy to reduce the likelihood of early lapse. This could be achieved through practicing adaptive coping strategies, such as cognitive reappraisal or relaxation, as alternative means of regulating affect. Successful implementation of these strategies would likely increase emotional relief self-efficacy, reduce lapses, and serve to maintain motivation for change (Bandura, 1986).

High positive cannabis expectancies were associated with lower refusal self-efficacy, consistent with the hypothesis that positive expectancies increase substance use by undermining self-efficacy (Connor et al., 2014; Gullo et al., 2010). The more rewarding cannabis use is believed to be, the more difficult a patient will find it to refuse in cued situations. Importantly, expectations of negative reinforcement (tension reduction) are included in the positive expectancies scale and are likely to be most relevant to emotional relief self-efficacy. These findings support the proposal that self-efficacy acts as the final pathway to human behaviour (Bandura, 1999), including cannabis use. Litt et al. (2008) reported that increases in refusal self-efficacy was the primary common mechanism through which different psychological treatments achieved abstinence at 12 months post-treatment. Thus, there are several ways refusal self-efficacy could be strengthened. Our results suggest that, for patients reporting strong positive expectancies, challenging these exaggerated beliefs about the rewarding effects of cannabis may be an effective method of improving self-efficacy (Gullo et al., 2010). However, caution is required when inferring directionality here, given expectancies and self-efficacy were measured at the same time point.

Negative expectancies predicted a lower likelihood of cannabis lapse, consistent with Boden et al.'s (2013) analysis of self-initiated abstinence in military veterans. Boden et al. also reported negative expectancies predicted average amount consumed, but their study did not control for self-efficacy. The present study found no association and this is in line with Connor et al.'s (2014) study of court-referred cannabis users not engaged in treatment, who also controlled for self-efficacy. Connor et al. reported a positive association between negative expectancies and severity of cannabis dependence, but the prognostic implications of this were limited by their study's cross-sectional design. The present results and those of Boden et al. demonstrate clearly that negative expectancies predict lower likelihood of lapse. The present study further demonstrates that this protective effect is independent of refusal self-efficacy and, at least for patients undergoing CBT, is unrelated to the severity of a lapse if it occurs. It is likely that pre-treatment negative expectancies are an important determinant of motivation for abstinence. Strategies that highlight the negative impact of cannabis on patient health will likely further reinforce this motivation (Copersino et al., 2006), irrespective of a patient's confidence in their ability to refuse cannabis. Strategies may include cost-benefit analyses and evoking cognitive dissonance over how continued cannabis use interferes with long-term goals (Beck et al., 1993; Miller and Rollnick, 2012). The large sample and longitudinal design of the present study allows for stronger inferences as to the direction of effects between cognition and cannabis use in clinical settings.

This study has limitations. Social cognitive variables were only measured together at the start of treatment. This limits inferences about direction of effects between expectancies and self-efficacy (including mediation), as well as how treatment-related changes in these domains affect treatment outcome. Social Cognitive Theory predicts that, in the context of substance use, outcome expectancies influence self-efficacy beliefs (Bandura, 2001; Oei and

Baldwin, 1994). Tracking session-by-session changes in refusal self-efficacy and expectancies could provide valuable insights into which components of CBT more effectively impact upon these beliefs and, ultimately, lead to better outcomes (Gwaltney et al., 2005). Although pre-treatment assessment is common in addiction research, cannabis withdrawal may have impacted on cognition and influenced completion of instruments (Hall, 2015). Future research employing independent measures of psychopathology will provide a better indication of the role of comorbid mood and anxiety symptoms. This study also relied on self-reported cannabis use and abstinence. Future studies could benefit from corroboration from biological markers of cannabis metabolites. Lastly, treatment was delivered in a public hospital outpatient clinic. While the abstinence program was manualized, fidelity checks would have been desirable as treating psychologists were free to diverge from the program in accordance with their clinical judgment. On the other hand, this freedom likely increases the generalizability of findings to the 'real world'.

In conclusion, this is the first study to investigate the unique contribution of outcome expectancies and refusal self-efficacy to the prediction of treatment outcome in cannabis dependence. Emotional relief self-efficacy was the most consistent predictor of outcome and may mediate the effects of positive expectancies on cannabis use, making it an important target for psychological treatment. Negative expectancies directly predicted greater likelihood of abstinence. Overall, findings provide further support for the utility of Social Cognitive Theory in the assessment and treatment of cannabis use disorder. Future studies need to employ more frequent assessments of expectancies and self-efficacy to elucidate the dynamic association between treatment-related changes in cognition and treatment outcome.

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AUTHOR DISCLOSURES

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Conflicts of interest: none

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Figure Captions

Figure 1. Mediation of positive cannabis expectancies effect on treatment outcome.

***p* < .01.

****p* < .001.

Mediation effect on abstinence: CI 95% -0.550, -0.086;

Mediation effect on days used: CI 95% 0.011, 0.052;

Mediation effect on amount used: CI 95% 0.012, 0.043.

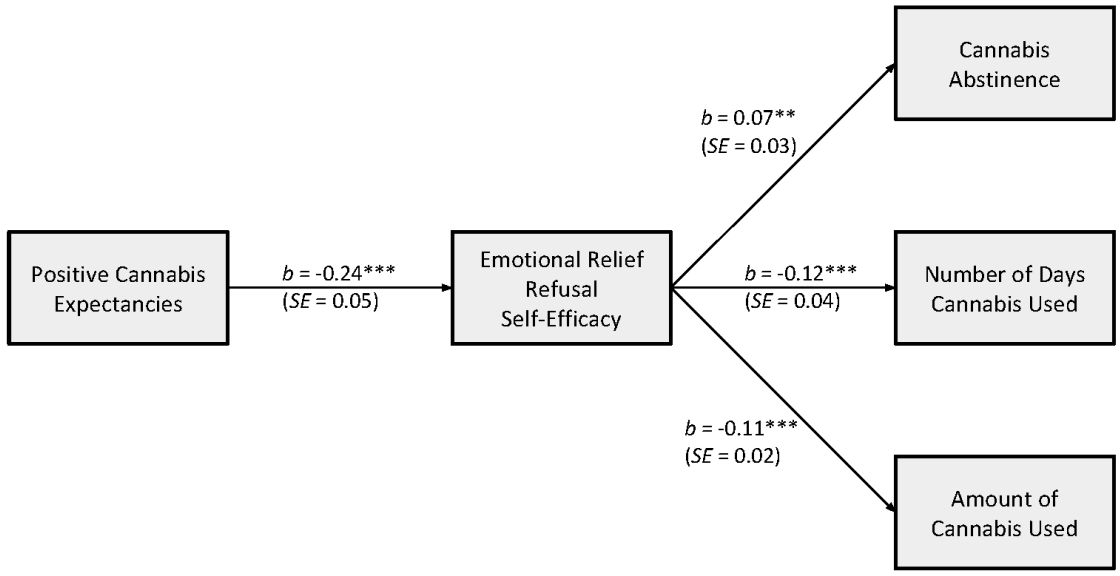

Table 1. Descriptive statistics of the sample (N = 221).

	Mean	*SD*	*Range*
Age (years)	30.10	8.72	18 - 59
Positive Expectancies[a]	51.59	11.84	21 - 86
Negative Expectancies[a]	80.44	19.97	24 - 133
Emotional Relief Self-Efficacy[b]	19.58	9.96	6 - 36
Opportunistic Self-Efficacy[b]	15.05	7.37	0 - 30
Social Facilitation Self-Efficacy[b]	12.94	4.51	0 - 18
Severity of Dependence[c]	9.54	2.85	0 - 15
Anxiety (GHQ-28)[d]	9.62	5.40	0 - 21
Depression (GHQ-28)[d]	6.64	5.93	0 - 21
Somatic Symptoms (GHQ-28)[d]	7.34	4.37	0 - 21
	n	*%*	
Gender			
Male	163	74	
Female	58	26	
Completed High School			
Yes	107	48.4	
No	114	51.6	
Currently Employed			
Yes	175	79.2	
No	46	20.8	

Note. GHQ-28 = General Health Questionnaire-28 (Goldberg & Williams, 1991).
[a]Higher scores reflect higher expectancy.
[b]Higher scores reflect greater refusal self-efficacy.
[c]Higher scores reflect greater dependence severity.
[d]Higher scores reflect poorer psychosocial functioning.

Table 2

Social cognitive predictors of cannabis abstinence (N = 221).

Parameter	Unstandardized coefficient	*SE*	*z*	*p*
Fixed effects				
Constant, β_{0j}	0.318	0.338		
Step 1				
Time between sessions$_{ij}$	-0.009	0.009	1.00	.32
Session number$_{ij}$	0.181	0.091	1.99	**.047**
Step 2				
Time between sessions$_{ij}$	-0.011	0.009	1.22	.22
Session number$_{ij}$	0.177	0.097	1.82	.07
Positive expectancies$_{ij}$	0.023	0.015	1.53	.13
Negative expectancies$_{ij}$	0.018	0.008	2.25	**.024**
Emotional relief self-efficacy$_{ij}$	0.074	0.026	2.85	**.004**
Opportunistic self-efficacy$_{ij}$	0.028	0.032	0.88	.39
Social facilitation self-efficacy$_{ij}$	-0.050	0.060	0.83	.41
Random effects				
Ω_u	2.023	0.412		

Table 3

Social cognitive predictors of number of days cannabis used (N = 221).

Parameter	Unstandardized coefficient	*SE*	*z*	*p*
Fixed effects				
Intercept, β_{0j}	1.699	0.375		
Step 1				
Time between sessions$_{ij}$	0.014	0.009	1.56	.12
Session number$_{ij}$	-0.225	0.097	2.32	**.02**
Step 2				
Time between sessions$_{ij}$	0.015	0.010	1.50	.13
Session number$_{ij}$	-0.226	0.101	2.24	**.03**
Positive expectancies$_{ij}$	0.007	0.020	0.35	.73
Negative expectancies$_{ij}$	-0.010	0.011	0.91	.36
Emotional relief self-efficacy$_{ij}$	-0.118	0.035	3.37	**< .001**
Opportunistic self-efficacy$_{ij}$	0.053	0.042	1.26	.21
Social facilitation self-efficacy$_{ij}$	0.022	0.080	0.28	.78
Random effects				
σ^2_e	4.771	0.386		
σ^2_{u0}	4.599	0.736		
Deviance (-2*log likelihood)	2240.788			

Table 4

Social cognitive predictors of cannabis consumption (in grams, N = 221).

Parameter	Unstandardized coefficient	*SE*	*z*	*p*
Fixed effects				
Intercept, β_{0j}	1.019	0.212		
Step 1				
Time between sessions$_{ij}$	0.005	0.006	0.83	.41
Session number$_{ij}$	-0.133	0.051	2.61	**.01**
Step 2				
Time between sessions$_{ij}$	0.005	0.006	0.83	.41
Session number$_{ij}$	-0.132	0.052	2.54	**.01**
Positive expectancies$_{ij}$	-0.014	0.015	0.93	.35
Negative expectancies$_{ij}$	-0.002	0.007	0.29	.77
Emotional relief self-efficacy$_{ij}$	-0.105	0.024	4.38	< **.001**
Opportunistic self-efficacy$_{ij}$	0.039	0.030	1.30	.19
Social facilitation self-efficacy$_{ij}$	0.075	0.056	1.34	.18
Random effects				
σ^2_e	0.807	0.080		
σ^2_{u0}	1.946	0.297		
Deviance (-2*log likelihood)	1090.330			