THE RELATIONSHIP BETWEEN CANNABIS OUTCOME EXPECTANCIES AND CANNABIS REFUSAL SELF-EFFICACY IN A TREATMENT POPULATION

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ABSTRACT

Aims: Self-efficacy beliefs and outcome expectancies are central to Social Cognitive Theory (SCT). Alcohol studies demonstrate the theoretical and clinical utility of applying both SCT constructs. This study examined the relationship between self-efficacy and outcome expectancies in a cannabis treatment sample, and tests formal meditational models. **Design:** Patients referred for cannabis treatment completed a comprehensive clinical assessment, including recently validated cannabis expectancy and refusal self-efficacy scales. **Setting:** A hospital alcohol and drug outpatient clinic. **Participants:** Patients referred for a cannabis treatment (N = 1115, mean age 26.29, SD 9.39). **Measurement:** The Cannabis Expectancy Questionnaire (CEQ), Cannabis Refusal Self-Efficacy Questionnaire (CRSEQ) were completed, along with measures of cannabis severity (Severity of Dependence Scale [SDS]) and cannabis consumption. **Findings:** Both cannabis expectancy and cannabis refusal self-efficacy were significant predictors of cannabis problems. When mediation was examined, partial support was observed for self-efficacy mediating expectancy beliefs. **Conclusions:** Both constructs appear important to cannabis use disorders and may have utility in cannabis prevention and treatment.

Key Words: Cannabis; Expectancy; Self-Efficacy; Mediation; Dependence; Social Cognitive Theory

INTRODUCTION

Worldwide, cannabis remains the most widely used illicit substance. Population estimates report between 2.8 – 4·5% of the adult global population are current cannabis users, with estimated prevalence rates around 10% in many high-income countries [1]. Applying Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) criteria, the 12 month prevalence rates of cannabis use disorders in the United States is 1.5% [2]. The associated impact on morbidity- particularly mental health problems, is well documented [3]. Approximately half of the estimated risk of problematic cannabis use is genetic in origin [4,5], leaving substantial contributions from other factors.

The contribution of environmental and cognitive mechanisms to cannabis misuse is not well understood. Social Cognitive Theory (SCT) [6,7] remains one of the most widely supported cognitive theories of the acquisition and maintenance of human behaviour. In SCT, Bandura identifies two constructs: self-efficacy and outcome expectancies. Outcome expectancies, sometimes referred to as "if... then" statements, are the perceived behavioural and affective consequences of engaging in specific behaviours. Self-efficacy refers to a person's belief they can successfully or unsuccessfully regulate their behaviour. Bandura [8] promotes self-efficacy beliefs as the "*foundation of human agency*" (p. 3). Both belief systems have been applied in substance use disorder prevention and treatment research, albeit with a strong focus on alcohol [9,10,11]. More recently, cognitive mechanisms of cannabis expectancy and cannabis self-efficacy have been examined.

A number of cannabis expectancy measures have been developed and validated in non-clinical samples (Marijuana Effect Expectancy Questionnaire [12], Marijuana Expectancy Inventory for Children and Adolescents [13], Memory Model-Based Marijuana Expectancy Questionnaire [14], Adolescent Cannabis Expectancies Questionnaire [15]). The Marijuana Effect Expectancy Questionnaire has also been validated though confirmatory

factor analysis in a polysubstance treatment setting [16]. Factor structures typically highlight positive (e.g. "I have more self-confidence when smoking cannabis") and negative (e.g. "Smoking cannabis makes me confused") features of cannabis expectancies. Studies consistently show that positive cannabis expectancies are associated with cannabis use and consumption, whereas negative cannabis expectancies are associated with non-use or reduced consumption.

The Cannabis Expectancy Questionnaire (CEQ) [17] is the first instrument to date to be validated in cannabis users in treatment [18]. The two factors observed in the previous non-clinical studies - negative expectancy and positive expectancy - were also evident in this clinical sample. Positive cannabis expectancies were associated with higher weekly cannabis use, and negative expectancy with higher dependence severity. Positive and negative expectancies also interacted to predict functioning on the General Health Questionnaire (GHQ-28) scales of somatic symptoms, anxiety, social dysfunction and depression.

Cannabis self-efficacy represents the second component of SCT. As with cannabis expectancies, they are associated with consumption and treatment outcomes [19]. Stephens et al. [20] reported that Self-Efficacy for Avoiding Marijuana Use scores [21] at the end of treatment added novel variance above consumption, temptation, coping, stress and peer use, to predict cannabis consumption up to 12 months post treatment. In a psychologically-based, multi-arm cannabis treatment study, patients' self-efficacy [20,21] was reported by Litt et al. [22] as the primary mechanism predicting abstinence 12 months post treatment, regardless of the psychological treatment approach employed. Litt et al. [23] additionally identified that self-efficacy changes over the course of treatment were related to coping skill development, and that both skill acquisition and self-efficacy contributed to reduced cannabis use. The authors concluded that treatment effects are directly related to the capacity of the intervention to reliably increase patient self-efficacy. Adapting the Smoking Situational Confidence

Questionnaire, Burleson and Kaminer [24] reported that higher situational self-efficacy beliefs predicted cannabis abstinence during treatment. Similar to Litt et al. [21], self-efficacy improved prediction of abstinence independent of treatment approach.

Despite these promising findings, measurement of cannabis self-efficacy did not minimum psychometric requirements. The Cannabis Refusal Self-Efficacy Questionnaire (CRSEQ) [25] has recently validated in a cannabis treatment population [26]. It employed both exploratory and confirmatory construct validity, concurrent validity and gender invariance and reliability testing. This multi-dimensional instrument measures three components of cannabis self-efficacy: Emotional Relief, Opportunistic and Social Facilitation. The sub-scales uniquely predict cannabis use and cannabis dependence severity and are similar in structure to the self-efficacy beliefs identified in alcohol refusal [27].

Up to now, cannabis expectancy and cannabis refusal self-efficacy have only been examined independently. This approach does not take full advantage of SCT. While findings from alcohol studies repeatedly demonstrate the predictive power of self-efficacy [e.g. 28, 29, 30], including both SCT constructs gives additional theoretical and clinical utility [9,31]. Cross-sectional studies show drinking refusal self-efficacy adds unique variance over alcohol expectancies in predicting alcohol consumption and problem drinking [32,33, 34,35]. Longitudinally, both alcohol expectancy and drinking refusal self-efficacy predict alcohol consumption over a [36] and binge drinking 3 months later [37]. Young et al. [38] found that both alcohol expectancy and self-efficacy could discriminate between patients who successfully completed alcohol dependence treatment from those who did not. Where formal mediation has been tested, both cross-sectional [39] and prospective [40] evidence suggests a significant proportion of the risk conveyed by alcohol expectancies for problem drinking, is mediated by self-efficacy.

Treatment studies have identified self-efficacy (as measured by the Drinking Refusal Self-Efficacy Questionnaire, DRSEQ [27, 41]) as the only significant mediator of treatment outcomes when readiness to change, perceived risk, norm estimates and positive drinking expectancies were also considered [42]. However, Kadden and Litt's [19] review on substance abuse self-efficacy concludes that the increased recent interest in the role of self-efficacy as a mediator of substance abuse problems would benefit from further empirical support. A mediating role for self-efficacy makes theoretical and clinical sense. Almost two decades ago, Oei and Baldwin [43] noted that when an individual is presented with a decision, the outcome will also be dependent upon the strength of the individual's belief that they are able to resist or refuse alcohol.

SCT has had considerable impact on our understanding of human behaviour, and along with other cognitive models, has profoundly influenced our understanding of the use and maintenance of substance use disorders [44,45]. Evidence suggests that consideration of concurrent expectancy and self-efficacy beliefs provides more powerful prediction of use and treatment outcome. More recent research points to a meditational process. Psychometrically robust cannabis expectancy and cannabis self-efficacy measures are now available [18, 26]. Of interest in this study is the unexplored relationship between expectancies and self efficacy in a cannabis sample in treatment. Based on previous research, we expect that both constructs will be significantly associated with cannabis use and dependence. We further anticipate that self-efficacy will mediate expectancy across these severity indices.

METHOD

Participants

Data were obtained from 1115 individuals referred for cannabis assessment as part of an illicit drug diversion initiative. The diversion program consists of a 2-hour comprehensive assessment of substance use and psychosocial functioning incorporating motivational

interviewing. Referral to further treatment is provided, if indicated. Data collection from the program is ongoing and previous psychometric measurement studies have analysed subsamples of this dataset [18, 26]. The present dataset contains 382 previously unanalyzed cases. Importantly, all cases included in Young et al.'s [26] path analysis examining cannabis refusal self-efficacy were excluded to avoid 'overfitting' the hypothesized model. Therefore, none of the 1115 cases have previously been submitted to path analysis. Human ethics approval was obtained.

The average age of the sample was 26.29 years ($SD = 9.39$). There were 878 (78.7%) males and 237 (21.3%) females. The majority were born in Australia (895; 80.3%) or New Zealand (74; 6.6%), with 26 (5.4%) identifying themselves as Indigenous Australians. Average weekly cannabis consumption was 3.59 ($SD = 5.85$) grams and the average SDS-C score was 3.06 ($SD = 3.09$). Approximately 48% were above the SDS-C screening cutoff for dependence (≥ 3, Swift et al., 1998). Most participants (80.7%) reported alcohol use in the previous month. Participants reported an average of 7.08 ($SD = 8.31$) drinking days in the past month, consuming an average of 84.52 ($SD = 121.61$) grams of ethanol on each drinking occasion. Half of the sample (52.7%) were current tobacco smokers, smoking an average of 13.92 ($SD = 9.39$) cigarettes per day.

Measures

Cannabis Expectancy Questionnaire (CEQ) [17, 18]. The CEQ is a 45-item questionnaire assessing positive (18 items, e.g., "I get better ideas when smoking cannabis") and negative (27 items, e.g., "I am more worried about what others are saying about me when I am smoking cannabis") cannabis use outcome expectancies. Items included a five-point, Likert-style response format (1 = *Strongly Disagree* to 5 = *Strongly Agree*). The questionnaire was initially developed with a community sample and validated on a large sample of cannabis users recruited from an outpatient clinic. The two subscales have

excellent internal reliability (α ≥ .90), and the CEQ's factor structure and criterion validity have been established across two samples [18].

Cannabis Refusal Self-Efficacy Questionnaire (CRSEQ) [25, 26]. The CRSEQ is a 14-item questionnaire assessing an individual's belief in their ability to resist smoking cannabis across various situations. Items ask respondents to rate their ability to resist smoking cannabis on a 6-point Likert-type scale ranging from 1 (I am very sure I could NOT resist smoking cannabis) to 6 (I am very sure I could resist smoking cannabis). Similar to the Drinking Refusal Self-Efficacy Questionnaire [27], it comprises three subscales: *Emotional Relief Self-Efficacy* (6 items; e.g., "When I feel upset"), *Opportunistic Self-Efficacy* (5 items; e.g., "When someone offers me a smoke"), and *Social Facilitation Self-Efficacy* (3 items; e.g., "When I want to feel more confident"). Like the CEQ, the questionnaire was developed with a community sample and validated on a large sample of cannabis users recruited from an outpatient treatment service. The questionnaire's internal reliability is good-to-excellent (α = .84 to .97), and its factor structure and criterion validity has been previously established [26].

Severity of Dependence Scale- Cannabis (SDS-C) [46,47]. The SDS is a 5-item questionnaire that is sensitive to severity of cannabis dependence [46]. Using Australian normative data, the SDS-C cut-off for likely cannabis dependence is ≥ 3 [47].

Cannabis Use was assessed by Masters- and PhD-qualified clinical psychologists using a retrospective diary approach over the past week. Psychologists had between 2 and 25 years alcohol and drug treatment experience (M = 10.5 years). If cannabis was not consumed in the past week, an estimate of typical weekly consumption was recorded. For the purposes of this study, 'joints' (cannabis cigarette) were quantified as 0.25 grams of cannabis, and 'cones' (use of 'bong' or 'pipe'), 0.10 grams of cannabis.

Data analysis

Structural equation modelling (SEM) was conducted in R (version 2.15.2) using the *lavaan* package (version 0.5-10) [48]. The hypothesized mediation model was tested using maximum likelihood estimation. The three subcomponents of cannabis refusal self-efficacy were operationalized as latent factors, with their items serving as indicators, all loading onto a higher-order refusal self-efficacy latent factor [26]. Due to the number of items on the CEQ, positive and negative cannabis expectancy were operationalised as latent factors with parcels of items serving as indicators. Item parcels were created by assigning individual CEQ items to parcels on an alternating basis (e.g., item 1 to parcel 1, item 2 to parcel 2, item 3 to parcel 3, and so on) [as per 39,49].

The χ^2 test was utilized as a statistical test of model fit ($\alpha = .050$) [50,51]. The comparative fit index (CFI), root mean-square error of approximation (RMSEA), and standardized root mean-square residual (SRMR) were also used to evaluate fit [50]. The following rules-of-thumb were employed to evaluate model fit. For "good" fit: CFI $\geq .95$, RMSEA $\leq .06$, SRMR $\leq .08$ [51]. Mediation was tested in two ways. First, the hypothesized full mediation model was compared to alternative partial mediation models using the chi-square difference test ($\Delta\chi^2$) [52]. Second, the mediation effect itself was estimated with the *RMediation* package [53] using the distribution-of-the-product method, which is the optimal approach to test mediation [54].

RESULTS

There were data missing on CRSEQ items (range = 14.3% to 25.8%) and all CEQ item parcels (range = 13.1% to 25.7%). Additionally, 185 (16.6%) participants had missing data on weekly cannabis consumption, and 79 (7.1%) had missing SDS scores. Little's Missing Completely at Random (MCAR) test revealed that the data were not MCAR, χ^2

9

(3211) = 4177.60, $p < .001$. Closer inspection revealed that missingness on weekly cannabis consumption was predicted by CRSEQ Item 1 ("When I am at a party", $p < .001$) and CRSEQ Item 2 ("When someone offers me a smoke", $p < .001$). Missingness on SDS Total was predicted by age, with older participants being less likely to provide SDS data ($p < .001$). Missing data were imputed using Full Information Maximum Likelihood (FIML) estimation, an optimal strategy for handling missing data [55]. Age and sex were included in the model as auxiliary variables and data were consequently assumed to be Missing at Random (MAR) [55].

The hypothesized full mediation model provided a good fit to the data (Table 1, Model 1). This model was compared to an alternative partial mediation model for weekly cannabis use that included additional direct paths from positive and negative expectancy to weekly cannabis use. This model provided a superior fit to the full mediation model (Table 1, Model 2). An additional model was also tested that specified extra paths from positive and negative expectancy to dependence severity. This model provided the best fit to the data and accounted for 7% and 20% of the variance in weekly consumption and dependence severity, respectively (Table 1, Model 3).

As shown in Figure 1, positive (unstandardized coefficient = -0.12, $SE = 0.02$, $p < .001$) and negative (unstandardized coefficient = -0.06, $SE = 0.01$, $p < .001$) cannabis expectancies were significantly associated with refusal self-efficacy. Refusal self-efficacy, in turn, predicted weekly cannabis use (unstandardized coefficient = -0.94, $SE = 0.18$, $p < .001$) and severity of dependence (unstandardized coefficient = -0.55, $SE = 0.09$, $p < .001$). Self-efficacy fully mediated the association between negative expectancy and weekly consumption (unstandardized mediation effect, CI95% = 0.03, 0.17). However, refusal self-efficacy only partially mediated the effect of positive expectancy on weekly consumption

(unstandardized mediation effect, CI95% = 0.06, 0.17). It still had a significant direct association with consumption (unstandardized coefficient = 0.26, *SE* = 0.08, *p* < .001).

Cannabis refusal self-efficacy fully mediated the association between positive expectancy and severity of dependence (unstandardized mediation effect, CI95% = 0.04, 0.10). However, refusal self-efficacy only partially mediated the effect of negative expectancy on dependence severity (unstandardized mediation effect, CI95% = 0.02, 0.06). Negative expectancy still had a significant direct association with severity of dependence (unstandardized coefficient = 0.21, *SE* = 0.03, *p* < .001).

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DISCUSSION

Cannabis expectancies and cannabis refusal self-efficacy beliefs have been independently associated with problematic use and treatment outcome. Applying Social Cognitive Theory (SCT) [6,7], this is the first study to examine the possible mediational relationship between expectancy and self-efficacy beliefs, as observed in other substance use. We applied newly developed, robust psychometric tools to a large clinical sample of cannabis users in treatment (*N* = 1115). Findings provide partial support for a meditational relationship

between cannabis expectancies and cannabis refusal self-efficacy (see Table 2; Figure 1). Cannabis refusal self-efficacy fully mediated negative expectancy in predicting consumption and fully mediated positive expectancy in predicting dependence severity.

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We confirm previous reports [14,18] that positive cannabis expectancies, but not negative expectancies, were a direct and significant predictor of cannabis consumption. Full mediation was observed when self-efficacy beliefs and negative expectations were combined in the one model, identifying a previously unreported pathway to cannabis consumption. Consistent with the SCT hypothesis, cannabis refusal self-efficacy played a mediating role predicting cannabis dependence severity. Full mediation was observed for positive expectancy, partial mediation for negative expectancy. Positive expectancies were only associated with cannabis severity via their association with low self-efficacy beliefs. Negative expectancies were directly associated with dependence severity, as well as indirectly though self-efficacy factors.

The study has limitations. While the sample size for treatment seeking cannabis users is large and measurement robust, the cross-sectional design does not allow an assessment of causality. In analogous research, prospective alcohol studies suggest that alcohol expectancies develop early, even vicariously [56], and play a significant role in predicting future alcohol problems [40]. Low self-efficacy beliefs are associated with post-treatment abstinence [57,58]. We cannot determine from these data if similar trajectories are evident for cannabis, as for alcohol. The findings may not be generalizable to all treatment seeking

samples and in particular we also had a high proportion of males. Biological markers of cannabis use over a longer period would have strengthened confidence in self-report consumption data. Greater power from expectancies and self-efficacy in predicting cannabis use over specific periods may be obtained if the assessment focuses more closely on that period, which may not be the same as those before or afterwards. SCT emphasises the contextual grounding of both self-efficacy (the specific task difficulty, physiological and emotional state, and amount of effort that the person expects to expend) and outcome expectancies. The expected outcomes of further cannabis use prior to finalisation of the clinical and forensic issues in the current sample may be different from the expected outcomes in the past or future.

The current findings indicate that modification of high negative and positive expectancies may be equally important targets in psychological interventions aimed at reducing consumption. Consistent with Bandura [8,9], low self-efficacy beliefs could be the final contributing pathway to heavier cannabis consumption. These are likely to provide additional efficacy as targets in cannabis prevention and treatment. In alcohol dependence, treatments aimed at developing alcohol refusal skills are effective, with therapeutic effects being mediated by increased self-efficacy [59]. By contrast, direct alcohol expectancy challenges have shown only modest efficacy, at least in prevention studies [60]. Given the strong association between expectancies and refusal self-efficacy found for both alcohol and cannabis, future research needs to investigate if added benefit occurs by combining these two approaches. Results reported here suggest that this could provide incremental benefit.

Consistent with previous theoretical and empirical alcohol studies, both cannabis expectancy and cannabis refusal self-efficacy were significant predictors of cannabis problems. When mediation was formally examined, partial support was observed for self-

efficacy mediating expectancy beliefs. Preliminary evidence suggests both constructs are important in the aetiology of cannabis use disorders.

Role of Funding Source

Contributors

A/Prof. Connor, A/Prof. Feeney and Prof. Young designed the study and wrote the protocol. All authors managed the literature searches and summaries of previous related work. Dr. Gullo undertook the statistical analyses. A/Prof. Connor and Dr. Gullo wrote the first draft of the manuscript. All authors significantly contributed to and approved the final manuscript.

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Table 1

Fit Indices for Full and Partial Mediation Models of Cannabis Cognitions and Use (N =

1115)

Model	χ^2 (*df*)	CFI	RMSEA (CI90%)	SRMR	$\Delta\chi^2$ (*df*)
1. Full mediation model	1608.28* (314)	.94	.06 (.058 - .064)	.05	
2. Partial mediation model (Weekly cannabis use)	1595.35* (312)	.94	.06 (.058 - .064)	.05	12.93[#] (2)
3. Partial mediation model (Weekly use & dependence)	1540.19* (310)	.94	.06 (.057 - .063)	.05	55.17* (2)

Note. CFI = Comparative Fit Index; RMSEA = Root Mean-Square Error of Approximation; SRMR =

Standardized Root Mean-Square Residual.

[#]*p* = .002; * *p* < .001.

Table 2. Tests of Mediation Summary

Expectancy	Self-Efficacy Partial Mediation	Self-Efficacy Full Mediation
Predicting Cannabis Consumption		
Positive	X	--
Negative	--	X
Predicting Cannabis Dependence Severity (SDS)		
Positive	--	X
Negative	X	--

Figure Legends

Figure 1. Partial mediation model of the relationship between cannabis expectancy, cannabis refusal self-efficacy, weekly cannabis use and dependence severity. Standardized parameter estimates are presented. All estimates are statistically significant at $p < .05$, except where indicated (#).