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Barriers to cannabis treatment and the effectiveness of psychotherapeutic interventions for Cannabis Use Disorder (CUD)

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Glossary

Abbreviation	Explanation
APA	American Psychological Association (thesis is edited in APA format)
BL	at baseline
DSM	Diagnostic and Statistical Manual
DAST	The Drug Abuse Screen Test
CBT	Cognitive Behavioural therapy
CM	Contingency Management
ContM	Contingency Management
CUD	Cannabis Use Disorder
CUDIT	Cannabis Use Disorder scale revised
DC	Delayed Control
DFC	Delayed Feedback Control
DTC	Delayed Treatment Condition
HBM	Health Belief Model
IAI	Individualised Assessment and Intervention
IATP	Individualised Assessment and Treatment Program
ME	Motivational Enhancement
MBTV	Motivational Behavioural Training plus Abstinence based Voucher
MCU	Maintenance Checkup
MDFT	Multidimensional Family Therapy
MET	Motivational Enhancement Therapy
MMF	Multi-media Feedback
MSPSS	Multi-dimensional Scale of Perceived Social Support
NCU	No Checkup
N/S	Not Specified
OTI	The Opiate Treatment Index
PCUD	Possible Cannabis Use Disorder
PF	Personalised Feedback
RCT	Randomised Control Trial
RP	Relapse Prevention
RPSG	Relapse Prevent Support Group
SDS	Severity of Dependence Scale
SUD	Substance Use Disorder
SSP	Social Support Intervention
THERAPIST	Therapist-delivered MET/CBT/CM
TLFB	The Timeline Followback

Summary

Cannabis is by far the most widely used illegal substance in the UK, and problematic cannabis use has grown substantially year on year. Despite the increasing need for cannabis treatment (support provided by health professionals, for example, psychotherapy), treatment uptake is considerably low. Whilst treatment system barriers (for example, negative views about treatment) are the most frequently reported barrier for not seeking treatment, psychotherapeutic treatments for cannabis show lower and unsustainable effectiveness rates. In light of this evidence, the current thesis comprises a unified body of work which contains (a) an empirical study (Chapter 2) exploring treatment-seeking decisions among 77 self-identified regular cannabis users; (b) and a mapping review (Chapter 3) examining the effectiveness of psychotherapeutic treatment for cannabis across 19 Randomised Control Trials (RCTs). The empirical study recruited participants with different levels of cannabis use/dependence, perceiving various degrees of harm, and experiencing varying extents of social support. Overall, 14% of the sample had ever sort formal help, 15.5% sought informal help and 70.1% had sought no help. Nearly half of the sample would not seek any help, 25% informal help and 22% formal help. Results showed an association between (a) higher perceived harm of cannabis with higher levels of use and preference for formal help and, (b) higher social support with lower levels of use and preference for informal help. Building on this, the mapping review included 19 RCTs on psychotherapeutic treatments for cannabis. Results from meta-analysis showed that psychotherapeutic treatments are effective in reducing the frequency of cannabis use, however, generalisability of this finding is ambiguous due to heterogeneity between the studies. Across all studies, CBT was the most commonly utilised intervention and treatment

outcomes such as frequency of cannabis use and continuous abstinence were consistently studied using TLFB interviews.

Taken together the findings from the thesis suggest that objective treatment need for cannabis problems should be examined considering the social context of cannabis use and varying experience of harm. For example, those who perceive their cannabis use to be harmful are more likely to seek treatment, whereas those perceive to have high social support are less likely to seek treatment. To reduce treatment-seeking barriers for regular cannabis use, options for easily accessible, low-threshold, person-centered help should be offered. In order to gain a complete understanding of how outcomes selected in RCTs translate into tangible benefits for patients, especially in terms of reducing barriers to treatment, cannabis treatment trials require: (a) consensus agreement in determining optimal outcome measures, (b) consideration of other relevant outcomes such as self-efficacy.

Chapter 1

**An overview of cannabis literature and what leads to
cannabis users not seeking treatment**

Cannabis remains the most widely used illegal substance in the UK, with 7.8% of people aged 16 to 59 having used it in the year ending March 2020 and approximately one-third of these individuals using cannabis frequently (used it more than once in a month) (Office for National Statistics, 2020). Cannabis compounds stimulate the reward/pleasure centers (e.g., feeling of euphoria) in the orbitofrontal cortex, striatum, and anterior cingulate gyrus regions along the mesocorticolimbic-reward pathway (sometimes referred as the pleasure centre of the brain) in the brain. This may result in repeated consumption of cannabis which in turn leads to brain neuroadaptation, i.e., the brain undergoes enduring and perhaps permanent neurobiological changes. This effect in the brain remains long after cannabis use, therefore, makes quitting more difficult (Volkow et al., 2004). As a result, repeated and heavy consumption of cannabis may lead to physical and mental health issues as well as substantial levels of dependence.

In the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*; DSM 5 (American Psychiatric Association, 2013), the diagnostic criteria for Cannabis Use Disorder (CUD) includes pattern of cannabis use causing severe clinical impairments, “as manifested by at least two of the following criteria: (a) Heavy use of cannabis use over a long period (b) uncontrolled use of cannabis (c) a long duration of time spent to obtain cannabis, and go through recovery (d) a strong urge to take cannabis (e) problematic use of cannabis affecting performance at school or work (f) dysfunctional social life or personal life due to the excessive use of cannabis (g) continued use of cannabis despite the negative effects on crucial day to day activities (h) risky use of cannabis (i) continued use of cannabis despite the knowledge of harm associated with the use (j) high tolerance of cannabis (k) manifestation of withdrawal symptoms”. (American Psychiatric Association, 2013, p. 509). The United Kingdom (UK) Focal Point report in 2018 found that cannabis was the second

most common Substance Use Disorder (SUD) treatment, for which people enrolled, after heroin (*United Kingdom Drug Situation 2019*, n.d.).

Substance use initiation and problem use

Vulnerability to psychoactive substances

Psychoactive substances have chemical compounds which, “when taken in or administered into one's system, affect mental processes, e.g. cognition or affect” (*WHO | Psychoactive Substances*, 2019, p. 8). Cannabis is by far the most commonly used psychoactive drug in the world (European Monitoring Centre for Drugs and Drug Addiction, 2018). Vulnerability to psychoactive substances, at an early stage of life (between the ages of 12-15) increases the risk for substance use initiation and addictive disorders (Wagner & Anthony, 2002). For example, individuals who initiate cannabis use at an early age are more likely to have a long-term dependency to cannabis with negative health consequences (Volkow et al., 2014). Similarly, early cannabis initiation also correlates with future problematic use (e.g., risk of CUD) initiation of other drugs and mental health problems (such as psychosis syndrome, characterised by hallucinations and delusions) (Hammond et al., 2014).

Although cannabis use initiation occurs in an early age, adulthood is the time period marked with heavy use (WHO, 2016, p. index4). Past studies have reported that adults are more prone to experiencing the adverse effects of cannabis as compared to adolescents (Mokrysz et al., 2016). In consistent with these findings, a genetic study on the mechanisms of cannabis addiction, reported that the genetic factors underlying psychoactive substance use increase with age, the

environmental factors decrease (Koopmans et al., 1997). This may also explain why adults have higher rates of cannabis treatment-seeking than adolescents (Public Health England, 2018).

Cannabis use initiation and maintenance

Genetic and Environmental influences

In the UK, cannabis use initiation typically begins at age 16 -24 years (*Drug Misuse: Findings from the 2018 to 2019 CSEW*, 2019). A previous UK-based study has found that half of those who will use cannabis, would have started at the age of 16 (Atha, 2001). While a crucial role of additive genetic influence may determine the aetiology of CUD (Lynskey et al., 2002), a variety of social environmental factors including peer selection; low family support; poor neighbourhood cohesion; and increased level of drug availability may also influence cannabis use behaviour (Munk et al., 2017). Past research suggested that initiation of drug use is highly influenced by social environmental settings. Whereas progress from substance use initiation to heavy use, and from heavy use to abuse/dependence is associated with genetic factors (Glantz et al., 1992).

Drug use often occurs in a social environment and is considered as a social activity (Mennis et al., 2016). Therefore, the meaning of cannabis use initiation and related behaviours must be understood in relation to the social context. Social context refers to individuals' specific setting in which social interaction with others influence the temporal, environmental, situational and motivational factors for cannabis use (K. H. Beck et al., 2009). With each developmental stage, there may be a transition from family to peer influence, which may in turn influence cannabis use (Ellickson et al., 2004). Previous studies have shown that cannabis use initiation takes place in a social setting and perceived peer use is the strongest predictor of cannabis use initiation. Smoking

cannabis in a group with others is found to be the leading cause of early initiation and prolonged use (D'Amico & McCarthy, 2006). According to *Social Learning Theory*: “while considerable social support would be expected to precede initiation to use, the role transition towards becoming a user would also be expected to result in considerable increase in social support after initiation, when the user has been accepted into a 'drug subculture' environment” (Sadava, 1973, p. 374).

According to previous authors in cannabis literature “drugs, set and setting” are the three main factors influencing cannabis use (Weil, 1984). Social setting plays a vital role in imposing an informal control to minimise the harm of drugs. The violation of these informal rules may lead to the exclusion from the society. In contrast, from a societal standard, drug use is already considered as a taboo. Therefore, heavy cannabis users tend to become socially isolated and perceive more social pressure to seek treatment (Weil, 1984). This may explain why many heavy cannabis users do not seek treatment to avoid stigma associated with seeking treatment in general.

Social Support

Social support can be defined as the experience of being loved, valued, and cared about both psychologically and physically by other members in a close social network such as family, friends or community (Safree et al., 2011). It is the comfort received from other persons due to interpersonal relationships (Hirsh, 1981). Social support has several dimensions and has a substantial impact on the lives of people with CUD. A previous study measured the difference in treatment outcome among adults with substance use problems with high and low social support, during the intake and at a 6-month follow-up. Study found that patients who reported higher levels of social support (measured by The Interpersonal Support Evaluation List), responded better to treatment (psychotherapy) and were more inclined to continue treatment (Dobkin et al., 2002).

Perceived social support is the perception of having “at least three layers of relationships (community, network, and intimate), and that they provide instrumental and/or expressive functions” (Lin et al., 1985, p. 9). Past studies have indicated that perceived social support acts as “coping assistance” in moderating stressful events (Thoits, 1986 para.2). In case of cannabis use, studies have found that people with low perceived social support tend to have more psychological issues associated with cannabis (Dorard et al., 2014). One possible reason for this could be, the support provided by others acts as a barrier to stressors and promotes well-being (Steese et al., 2006). Additionally, perception of social support is entwined with management of problematic issues, which includes adapting cognitive and behavioural efforts to handle psychological stress. In this regard, past studies have highlighted the importance of receiving good quality social support in mediating treatment outcomes, entry and engagement during the primary stage of treatment or early stages of recovery (Osmany et al., 2014). Moreover, some authors have also suggested that appraisal of a long-term addiction as concerning or challenging results in the initiation of coping efforts and social support can significantly contribute to executing such actions (Dorard et al., 2014). In addition to this, cannabis is high on political agenda in several parts of the world. Some authors have suggested that cannabis has become “normalised” in the society with growing social and cultural acceptance of recreational use (Pennay & Measham, 2016). Social acceptance of cannabis-related behaviour and growing perception of cannabis as a “soft drug” play a vital role in shaping the affective component of attitude (Triandis, 1964). For example, with growing legal and social recognition of cannabis, an increasing number of people are using it more often (Mostaghim & Hathaway, 2013).

Family support

Unlike other illegal substances (such as heroin), harms associated with cannabis dependence are considered to be more psychological and less physical in nature (Nutt et al., 2007). The psychological harms of cannabis use (e.g., anxiety, depression) are influenced by multiple factors, including psychological risk factors (Fergusson et al., 2002). Evidently people with CUD tend to become socially isolated, however participation of other people in their treatment process reduces risk factors and bodes well for desirable results (Osmany et al., 2014). For this reason, family support appears to have a significant impact in determining the treatment decisions among individuals with substance use problems in general: “support from parents typically is indicated as a protective factor, inversely related to level of substance use.” (Pierce et al., 1996, p. 521). Furthermore, *Life-Course Theory* perspective depicts that family plays a crucial role in: “contributing to the persistence or change in drug use” by providing the useful coping skills necessary to overcome substance cues (Hser et al., 2007 para. 1). Similarly, previous research noted that individuals with substance use issues with a higher level of family support were more likely to show retention in treatment (Dobkin et al., 2002). Likewise, a study about facilitators and barriers to treatment-seeking among individuals with cannabis dependence and without dependence found that: non-treatment seeking individuals with cannabis dependence reported less family support and perceived more social pressure to seek treatment (P. van der Pol, Liebrechts, de Graaf, Korf, Brink, et al., 2013b).

Coping

Coping is defined as strategies people use to deal with challenging situations or negative emotions. There are two prominent roles of coping: the management of the problem (“problem-focused

approach”) and the alteration of problematic thoughts (“emotion-focused approach”) (Konwar et al., 2015 para.4). Individuals with CUD with low social support, struggle to stay in treatment as they may lack emotion-focused coping techniques required to overcome stressful life events and substance cues (Osmany et al., 2014). Social and familial support have been found to be a key predictor in delivering coping skills in the treatment process. Previous studies have also showed that physical and psychological support provided by family and social networks may benefit, in times of stress, whilst being efficacious regardless of the type of coping skills that are used (Dorard et al., 2014; Osmany et al., 2014).

The psychosocial dynamics of cannabis-consumption behaviour

Risk perception

Among risk factors known to affect cannabis use, individual perceptions and ideas about illegal substances play a significant role (Legleye et al., 2012). In the context of drug misuse, *risk perceptions* are “beliefs about potential harm or the possibility of a loss. It is a subjective judgment that people make about the characteristics and severity of a risk” (Rachlin, 2013, p. 110). Risk perception is an essential variable in analysing the cognitive elements of risk-taking behaviour. Therefore, it constitutes an integral part of several health behaviour models including the Health Belief Model (Hochbaum et al., 1952). As pointed out by a previous study “perceived risk is an important factor in deciding whether or not individuals will engage in health-related behaviors” (Pacek et al., 2015 para. 3). Additionally, prior research has compared risk perception concerning effects of cannabis between individuals with cannabis dependence and occasional use. Results showed that individuals with cannabis dependence tend to have lower risk perception compared to individuals with occasional use (Hemmelstein, 1995; Poikolainen et al., 2001).

Furthermore, Pretti-Watel et al., (2006) explained the concept of risk denial from social theories of deviance, and conveyed that individuals with regular cannabis use tend to justify and minimise the harmfulness of cannabis by comparing cannabis to other illegal substances (for example, heroin being more dangerous) (Pretti-Watel & Moatti, 2006). On the same note, individuals with heavy cannabis use perceive the risk associated with their personal use to be lower compared with other people's use (Danseco et al., 1999). Moreover, risk denial of cannabis use is highly prevalent among individuals with multiple substance dependence. One previous study has highlighted that, among adults, risk perception significantly varied depending on the type of illegal substance (lower risk for cannabis), and low perception of risk positively correlated with high frequency of use (Duistman & Colbry, 1995). Finally, in neuropsychology, risk-taking decisions concerning cannabis use, have been associated with the effects of THC which causes frontal lobe disruption. Prior research in this subject has established that heavy cannabis use with higher exposure to THC tends to lower the ability to judge consequences of decision-making (Lane et al., 2005).

In substance use literature, Nutt et al., (2007) comprehensive work on assessment of harm caused by illegal and legal provided a framework to analyse a range of substances from three parameters of harm (physical harm, dependence and social). In the case of cannabis use, authors ranked the risk of long-term dependence and risk to cause problems in users' family higher than physical harm (e.g., physical withdrawal symptoms such as vomiting, diarrhoea or overdose). Consistent with these findings, a study examining the factor structure of cannabis risk perception, reported that perceived risk of the harmfulness of cannabis depended on the type of problem associated with it. Most participants considered addiction to be high risk in comparison with other cannabis-related risk factors. Notably, anxiety, which is one of the most common acute effects of CUD, was not reported as a significant risk (O'Callaghan et al., 2006).

It is important to note that, despite being illegal in many countries and having significant health outcomes for some users (e.g., risk of psychosis), cannabis use is part of the culturally established norm in several countries. For example, in Jamaica, “cannabis is integrated with many dimensions of Jamaican culture and is governed by social rules that guide its use and inhibit abuse” (Spicer, 2002 para. 48). On this note, a previous epidemiological survey proclaimed that for individuals with cannabis use, handling the contradictory image of cannabis - normalised, illegal and harmful - can result in developing a special bond with it by integrating the subjective elements (subjective decision, motives) to the established one (the social image, illegality and risk associated with cannabis) (Apostolidis et al., 2006). Moreover, from a behaviourist perspective one may argue that the person’s acts and beliefs are considered consistent as the “acts are guided by beliefs”. However, authors of “cognitive dissonance theory” alter this notion and argue that when circumstances change, individuals may use the rationalisation technique to gain consistency between their beliefs and behaviour (Peretti-Watel & Moatti, 2006). Therefore, risk-taking in cannabis use from this theory is built on two suppositions: people desire for consistency between their beliefs and behaviour and this is achieved by modifying beliefs (cannabis is less harmful) rather than changing behaviour (quitting) (Johnson & Kenkel, 1991).

Adverse health effects of cannabis use

Molecular mechanism of cannabis addiction

As described on page 15, like any other illegal substance, continuous cannabis intake over a long period of time results in “brain neuroadaptation” that remains long after quitting cannabis. This is the neural mechanism in which the brain gets adapted to drug molecules, which in turn produces adverse effects on brain functioning and promotes relapse (Budney & Hughes, 2006). Recent

studies in cellular and molecular neurobiology have highlighted the mechanism by which cannabinoids develop long lasting modification in brain functioning and may lead to cannabis dependence and compulsive cannabis-seeking (Filbey et al., 2009). THC (tetrahydrocannabinol) which is the primary psychoactive compound found in cannabis combines with CB1 and CB2 cannabinoid receptors in the brain. These receptors are mainly located in the central nervous system of the brain which controls a variety of functions including memory, cognition, reward, etc (Murray et al., 2007).

Effects of cannabis on the brain

Genetic effects on human brain development begins in embryos, fully maturing by the age of 25. The adolescent period is marked by crucial transitions and the brain is more vulnerable to the harmful effects of psychoactive compounds such as THC. As supported by the findings of previous studies, early exposure to THC in the brain results in higher tolerance for other psychoactive drugs (DiNieri & Hurd, 2012). Similarly, the consumption of cannabis during early adolescence hinders the brain's reward system in different parts of the brain. The dysfunctionality of neural connectivity of the brain is particularly detrimental to adolescents and young adults as their brain is still in the developmental stage.

Data from epidemiological and preclinical studies state that cannabis use can cause tolerance for other psychoactive drugs in adolescence and multiple dependence in adulthood. These findings are supported by clinical data of animal studies depicting that overexposure to “THC can prime the brain for enhanced responses to other drugs” (Volkow et al., 2014 para. 4). Excessive cannabis use is also measured with the development of mental health problems. Several studies have examined the association between schizophrenia (mental health condition which causes psychosis) and CUD

(Caspi et al., 2005). Numerous lines of evidences in cannabis literature suggest a relationship between long term cannabis use and schizophrenia (Patel et al., 2020). A previous meta-analysis on rates of CUD among individuals with schizophrenia found that around 25% of patients with schizophrenia met the criteria for CUD (Koskinen et al., 2010). Although these findings suggest that neurobiological changes associated with cannabis use are similar to those found in schizophrenia, cause-effect relationship can be established, as many individuals with similar changes do not develop schizophrenia.

Laboratory studies have found that the THC compound of cannabis causes "dose-related" effects on the Central Nervous System (CNS) which includes the thought processing speed, awareness, reaction to the environment, alertness and motor functions (Ramaekers et al., 2004). The most common risk emerges from these effects is road accidents (Kalant, 1999). Several past studies have showed a strong association between driving under the influence of cannabis and fatal car accidents (Group, 2005). Interestingly, these associations were more common among individuals with occasional than regular use. In a previous case control study, authors measured the level of responsibility for accidents among people involved in car accidents and reported that 3% of the total population were driving under the influence of cannabis. (Laumon et al., 2005). Similarly, another study analysed the association between cannabis use and hospitalised injury among individuals with and without cannabis use. Results showed a considerably high rate of hospital admissions among individuals with cannabis use (Gerberich et al., 2003). Additionally, another existing study in this subject examined THC in the blood in a cohort of 1420 Australians killed in accidents and found that there existed a dose-response relationship between THC and the level of liability among those who were driving under the influence of cannabis (Ramaekers et al., 2004) .

Available treatment

Before exploring available treatment for cannabis-related problems, it is important to discuss the pathways into these treatments which determine how many people with CUD could benefit from treatment. In the UK, people with CUD can access treatment via: government funded health care system (NHS) (via General Practitioner referral or at A&E department); direct contact with drug treatment services; the criminal justice system (if the person has committed an offence); or private healthcare (which is expensive) (*Drug Addiction*, 2018). Treatment services are typically provided in two types of settings depending on the severity of problems: outpatient (at a drug service centre on an appointment basis) or private rehab (fully or part residential) (*Drug Addiction*, 2018). In the UK, community drug services also deliver a range of services including detoxification, counselling, advice and medical support (*Drug Addiction*, 2018). Non-profit self-help organisation such as Narcotics Anonymous (NA) also provide support for those who desire to quit drugs. People in the organisation meet regularly to help each with their drug use (recently it has been hosted via the internet) (*UKNA | Narcotics Anonymous in the UK*, n.d.). These services are usually accessible in normal working hours (between 9am to 5pm), however, appointments are required to access most services along with a long waiting period (Beattie et al., 2018). Previously, a study comparing organisational differences in healthcare between the UK and the US reported that “Britain performed best in offering health care that was equitable, even though waiting times for treatment were the longest” (Ham, 2005 para.3).

Psychotherapeutic treatments for CUD are the most widely used intervention and have evolved drastically with the ongoing clinical trials (Sherman & McRae-Clark, 2016). These interventions have shown some promising results in decreasing the frequency of cannabis use, minimising the symptoms and maintaining abstinence over a long period of time (Budney et al., 2006; Marijuana

Treatment Project Research Group, 2004). Most CUD clinical trials on effectiveness of cannabis-treatment focus mainly on *Cognitive Behavioural Therapy* (CBT) (J. S. Beck, 2011); *Motivational Enhancement Therapy* (MET) or *Motivational Interviewing* (MI) (W. R. Miller & Rose, 2009); and *Contingency Management* (CM) (Petry, 2011). Past studies advocated that a combined intervention, including all three approaches, produce the best results (Budney et al., 2006). To note, key principles which inform these treatment approaches in a broader sense are discussed in Chapter 3. The current section covers the application of these interventions for CUD.

CBT is the most widely adapted intervention for CUD. CBT refers to “a class of interventions that share the basic premise that mental disorders and psychological distress are maintained by cognitive factors” (Hofmann et al., 2012 para. 2). From a behavioural perspective, CUD is seen as a learned behaviour and maintaining abstinence is also an element of the same learning process (A. T. Beck, 2016). In CBT for cannabis use, therapists guide the patients to modify their thought process through cognitive rebuilding. Cognitive rebuilding involves altering irrational expectancies, modifying maladaptive ideas about cannabis use, and promoting ideas (for example, questioning about ways a thought could be interpreted) to achieve abstinence. It helps patients recognise contingencies (contingency is the relationship between two events, one being a consequence of the other event), of exercising behaviour and decreasing the chance of relapse whilst providing useful coping skills. CBT incorporates techniques such as “self-monitoring, cognitive rebuilding, cost-benefit analysis and role-playing” (Sherman & McRae-Clark, 2016 para. 6). Patients receive tasks/homework to pursue alternative prosocial behaviour. Patients learn new skills through homework completion, which in turn promotes their self-efficacy and motivates them to employ this set of skills in the future (Sherman & McRae-Clark, 2016).

Stephens, Roffman, and Simpson (1994) were the first to employ structured CBT techniques for treating adults with cannabis dependence. Participants were screened with the Drug Abuse Screening Test, (DAST Skinner, 1982) to determine symptoms of cannabis dependence. In the study, they assigned a total of 212 treatment seekers into either of the two groups: social support group (comparison group) and relapse prevention (CBT group). The result showed a significant decrease in the frequency of cannabis use among patients in both groups. However, the authors could not draw the conclusion which treatment worked better, they did not find a significant difference between the groups. Interestingly, it was reported that at a one-year follow-up, only 14% of all participants from both groups had maintained the abstinence. Finally, from their results they concluded that future studies need to examine abstinence rates using an unassisted group (no-treatment control group) against CBT group (Stephens et al., 1994).

To find out the optimal treatment duration, Copeland and colleagues (2001) examined the effects of varying treatment duration on treatment outcomes (for example, frequency of use, abstinence rate). The clinical trial recruited a total of 229 treatment-seeking participants with CUD. Participants were allocated to three different CBT treatment groups: “6-session CBT treatment (6CBT)”, “1-session CBT treatment (1CBT)”, and “delayed treatment control (DTC)” (Copeland et al., 2001a para. 1) . At a 12-week follow-up from the baseline, results showed higher abstinence rate in both 6CBT and 1CBT groups compared with DTC group (Copeland et al., 2001a). Therefore, the study concluded there was limited benefit for long-duration treatments, as both treatment groups did better than no treatment group. Nonetheless, the findings from the subsequent studies advocated for the effectiveness of prolonged interventions (Marijuana Treatment Project Research Group, 2004).

Originally designed for individuals with problematic alcohol use, MI (Motivational Interviewing) is a brief (1-4 session) person-centered intervention in which the therapist works from an empathetic approach towards helping clients in identification of their strength and motivation rather than providing them with skills and insight which they are missing (W. R. Miller & Rollnick, 2002). MET is a manualised version of MI (developed for project MATCH), which works from the same principle, however, it provides individualised assessment feedback which is particularly helpful for those who are ambivalent about change (Project MATCH Research Group¹, 1998). Similar to MI, in MET, the therapist helps patients to develop the motivation to change by providing open-minded remarks, helping with a person's thought process, and providing goals. Likewise, in MET practitioner employs an empathetic non-confrontational approach to bring out "*change talk*" (for example, "I need to quit smoking cannabis before it's too late") (Sherman & McRae-Clark, 2016 para. 27). This practice helps patients progress towards the necessary behavioural change.

"*The Marijuana Check-up*" (MCU) is a short-duration motivational programme rooted on the concepts similar to "*the Drinker's Check-up*", which has been successful in cutting down alcohol intake among individuals with Alcohol Use Disorder (Stephens et al., 2004). Despite its short duration, MCU has been effective in motivating individuals with cannabis problems to continue entering the treatment. In a follow-up study on the effectiveness of MCU, Stephens and colleagues (2004) reported a significant (the effect size were 0.34 and 0.69) reduction in the cannabis use patterns and dependency among patients receiving personalised feedback (a person-tailored summary of recipient's responses to the treatment) as compared to general feedback (information relevant to a large population of individuals with SUD) (Stephens et al., 2004). Similarly, Martin et al., (2008) designed "the Adolescent Cannabis Check-up" (ACCU) following the concepts of

MCU, comprising 2-session motivational intervention. At a 3-month follow-up the authors compared the ACCU group to a delayed treatment control group and found a significant reduction in the days of use and number of dependency symptoms (Martin & Copeland, 2008).

In cannabis use treatment, CM is the most frequently used intervention and is typically combined with CBT and MET. In general, CM is rooted in the concept of operant conditioning of positive behaviour. The targeted behaviour is achieved through reinforcement. It is most effective when reinforcement is applied frequently and instantly after the target behaviour. To reinforce a positive behaviour, a “reinforcement schedule” is provided and the breach of reinforcement criterion leads to the reconstruction of “reinforcement schedule” (Sherman & McRae-Clark, 2016). Budney and colleagues (2006) were the first to study the combination of CM with other behavioural interventions for CUD. In the trial, patients were randomly allocated to three groups: MET; MET plus behavioural skills training (MBT); or MBT plus an abstinence-based voucher program (MBTV). The results depicted a higher abstinence rate of the MBTV group during the treatment, as compared to other groups. The follow up results also showed that the MBTV (35%) group maintained higher abstinence throughout the treatment duration in contrast with the MBT (10%) and MET (5%) groups (Budney et al., 2006).

Although many studies focus primarily on CBT, MET and CM, alternative interventions such as *Multidimensional Family Therapy* (MDFT) (Liddle, 2010) have also been examined. MDFT is “family-based” therapy and has shown positive outcomes especially with a younger age group (T. M. van der Pol et al., 2017). In MDFT, patients receive therapy along with at least one family member. MDFT works on four intertwined domains: “the adolescent domain, the family-domain, the communicational domain, the extrafamilial domain” (Sherman & McRae-Clark, 2016 para. 25). In current cannabis literature, the combination of CBT, MET, CM and MDFT treatments have

shown promising results in reducing the frequency of use and dependence symptoms, however, the sustained abstinence rate is low. Therefore, the implementation of pharmacotherapy interventions for CUD is being actively studied. Medication for the treatment of CUD targets “cannabis withdrawal symptoms, abstinence initiation, relapse prevention, comorbidity and other psychotic disorders” (Sherman & McRae-Clark, 2016 para. 28).

Psychotherapeutic interventions are the mainstay of treatment for cannabis related issues and play a key role in bringing positive changes, maintenance of change and building resilience. There is a range of psychotherapeutic treatments available within cannabis literature, however clinical effectiveness of these interventions is not clearly demonstrated. Due to the variation between and within individuals in their cannabis use, experience of harm and social circumstances, ‘one-size fits all’ treatment would unlikely to be effective or practical. Nonetheless, given the complex nature of cannabis dependence, disapproval of medication for CUD, along with inconsistency in reporting treatment outcomes - a literature search is required to evaluate the success rates of psychotherapeutic interventions and if there is a gold standard measure of treatment effectiveness. To address this issue, Chapter-3 of the current thesis will explore how treatment outcomes in cannabis treatment trials are measured and what are the success rates of psychotherapeutic treatments in reducing frequency of cannabis use and increasing abstinence rates. Another important aspect of cannabis treatment is to address risks of relapse, provide support after the end of treatment, and facilitate a sustainable pathway for recovery.

Recovery from cannabis use

Cannabis treatment has a range of goals (for example, reducing psychological problems) that aim to reduce negative symptoms and promote positive behaviour change. Initially, treatment goals are

focused on urgent problems and harms related to individuals' cannabis use, however, as the treatment progresses, the goals shift towards building recovery and resilience (Hodgins & Stea, 2018). Recovery is defined as “a state of ongoing sobriety following long-term substance abuse” (*Recovery – APA Dictionary of Psychology*, 2007 para. 1). According to Drug misuse and dependence UK (2017), substance use treatment can be conceptualised as “journey into recovery” through four phases (assessment, engagement, behaviour change and early recovery), each phase requiring different levels (standard or enhanced care) of psychological and social support. From this perspective the pathway to recovery is a dynamic process involving varying degrees of support at different phases. In each phase, clinicians aim to identify resources that support individuals' long-term recovery (*Drug Misuse and Dependence*, 2017). In assessment phase, clinicians assess individuals' aspirations for treatment, their strength, their risk factors and plan their intervention accordingly. In engagement phase, clinicians focus on engaging individuals in treatment and building therapeutic relationship. In behaviour change phase clinicians aim to help individuals maintaining change in behaviour and building resilience. Finally, in early recovery phase clinicians focus upon strengthening recovery resources (example, positive social networks) and providing an after-care support system (for example, group attendance or Marijuana Anonymous) for those who have successfully achieved sustained abstinence from problematic use (*Drug Misuse and Dependence*, 2017).

Recovery has several definitions which vary across individuals, culture, religion and geographical locations, however, remission from substance use is considered as a crucial part of recovery (Fuller-Thomson et al., 2020). Remission, in terms of cannabis problems, refers to the elimination or reduction of major problematic symptoms associated with cannabis use to “sub-clinical” or less harmful level (Administration & General, 2016). A systematic review of cohort studies on

remission from illicit substance dependence found that cannabis dependence had higher remission rates (0.173; 95%CI 0.143, 0.208) as compared to amphetamine (0.164; 95%CI 0.148, 0.180); opioid (0.092; 95%CI 0.084, 0.098); and cocaine (0.053; 95%CI 0.050, 0.060) (Calabria et al., 2010). In the review remission from dependence was defined as no longer meeting the diagnostic criteria of cannabis dependence or complete abstinence from using cannabis, investigated through follow-up periods of at least 3 years. The review also reported that one in six individuals with cannabis dependence achieve remission annually. Similarly, another study about remission from life-time nicotine, alcohol, cannabis and cocaine dependence reported that fifty percent of those with cannabis dependence remit within 6 years of dependence onset and lifetime probability of cannabis remission is much higher (97.2%) compared with nicotine (83.7%) and alcohol (90.6%) (Lopez-Quintero et al., 2011). Some of the most common explanations for stopping cannabis use given by former frequent cannabis users were emotional maturation, new roles and responsibilities in life, and a change of environment (Lopez-Quintero et al., 2011). The main reasons described for change attempts were experience of negative effects, altered perception of cannabis, concerns about harm related to their cannabis use, lack of money, boredom, and psychological health effects.

The core concept of recovery is associated with personal change which goes beyond merely quitting cannabis use (Fuller-Thomson et al., 2020). Recovery process is conceptually broader than abstinence or remission. For example, the Substance Abuse and Mental Health Service Administration (SAMSHA) conceptualises recovery as “a process of change through which individuals improve their health and wellness, live a self-directed life, and strive to reach their full potential” (Nugent, 2016, p. 6). Thus, cannabis recovery not just requires achievement of treatment goals but also the provision of support for stable housing, employment, and other social/environmental factors (Hodgins & Stea, 2018). In previous studies, several individuals who

successfully stopped using cannabis described a change in environment or uptake of new roles and responsibilities as the main reason for quitting (Hodgins & Stea, 2018). Therefore, a recovery care plan should be designed considering the social and environmental context in which individuals experience their problems. In the UK, Department of Health guidelines recommend mutual aid therapies and self-help for those recovering from cannabis use (*Drug Misuse and Dependence*, 2017). In Mutual Aid Therapy (for example, Marijuana Anonymous), individuals with similar experiences (for example, cannabis use problems) form a social support network through which they help each other overcome issues (*Mutual Aid Framework*, 2015). Additionally, in recent years, Self-Management and Recovery Training (SMART) has also gained an increased popularity in the UK (*Self-Help Addiction Recovery*, 2010). SMART is a support group (available in treatment centres or via web meetings) for individuals recovering from cannabis and other substance use problems. SMART is based on CBT and rational emotional behaviour techniques. Individuals are provided information on “staying motivated after rehab, prevent craving and the importance of living a well-balanced life” (*SMART Recovery*, 2017 para. 4).

Intentions to Change

Treatment Barriers and Help-Seeking

Treatment is defined as the delivery and administration of appropriate measures (for example, psychotherapeutic approach) which are formulated to help individuals with health problems (*Treatment – APA Dictionary of Psychology*, 2007). Treatment-seeking is defined as an active pursuit of treatment by individuals who desire to improve their health functioning (*Treatment-Seeking Behavior – APA Dictionary of Psychology*, 2007). Whereas, help-seeking refers to searching or requesting support from others through informal or formal mediums of support such

as though healthcare providers or friends and family (*Help-Seeking Behavior – APA Dictionary of Psychology*, 2007).

As described on page 24, individuals with long-term cannabis use are at high risk of developing CUD (von Sydow et al., 2002). Similarly, those who report using cannabis daily (heavily), persistently, and from an early stage of life, are more likely to need interventions to overcome cannabis dependence and achieve long-term abstinence (Budney et al., 2007a). Despite the myriad of negative consequences associated with long-term cannabis use, a disproportionately small number of individuals, who use cannabis regularly, utilise treatment (Pol et al., 2013). Studies addressing some barriers to treatment-seeking found that on average people using cannabis for more than 10 years take at least six attempts to quit, before seeking professional help (Budney et al., 2007a).

There are a variety of factors that vary considerably between individuals who seek treatment for cannabis problems and those who do not seek treatment (Compton et al., 2004). Some of the variables that have been explored in this context are the characteristics of the person seeking treatment. For example, a study based in the United States (US) found that most people who seek treatment for CUD tend to be single, male, school leavers; those who have been unsuccessful in completing treatments for other Substance Use Disorders (SUD) and have a history of other mental health problems (Strike et al., 2003). Additionally, most frequently reported barriers which may discourage individuals to seek treatment for cannabis is the belief that cannabis is not addictive, harmful, or is less dangerous than other illegal substances. Ellingstad and colleagues (2006) studied the treatment-related decisions of individuals with long-term cannabis use and found that most people with CUD do not perceive excessive cannabis use (measured by Drug Abuse Screening Test, DAST) as a problem in the United States (US). The majority of the participants

(80%) reported not seeking treatment because either they were not concerned about their cannabis use or preferred to receive informal help. Other reasons were a desire for self-recovery (76%); stigma avoidance (48%); uncertainty about treatment effectiveness (44%); confidentiality concerns (36%); hesitation talking about their problems (36%); treatment availability (32%); cost (28%); and self-consciousness (24%) (Ellingstad et al., 2006). Similarly, a Netherlands-based study explored the treatment seeking/non-seeking decisions among community-based individuals with cannabis dependence (who were not seeking treatment) and hospital-based patients receiving treatment for cannabis. Study found that the most common treatment barriers, among community-based individuals, were “desire for self-reliance (50%); preference for informal help (22.5%); and absent treatment need (16.9%)”. Additionally, subjective reasons for not seeking treatment included “desire for self-reliance (36.7%); treatment ineffectiveness (16.7%); and avoiding stigma (13.3%)” (P. van der Pol, Liebrechts, de Graaf, Korf, Brink, et al., 2013a, p. 16). While psychological characteristics of individual and lifestyle factors may serve as barrier to treatment-seeking, several studies on SUD have pointed out that treatment system barriers (refers to the characteristics of healthcare system which interferes with treatment utilisation) such as poor treatment accessibility, lack of consideration of patient-centered treatment goals) may also influence treatment uptake (Rapp et al., 2006). The most frequently reported treatment system barriers in cannabis literature are perceived ineffectiveness of treatment programs, perceived mismatch of goals with treatment program and problems with accessibility of treatments (P van der Pol et al., 2013; Gates et al., 2011).

Furthermore, previous studies analysing subjective attitudes towards cannabis treatment found that individuals with cannabis dependence held various beliefs about treatment. However, personal beliefs were particularly important for these individuals. Interestingly, people who were only

dependent on cannabis and less likely to use other illegal substances, showed less interest in treatment (which was also for other drug users), as they themselves did not have problems with other drugs (Vendetti et al., 2002). Moreover, individuals' view about their cannabis use also plays a vital role in determining their decision about entering treatment (Gates et al., 2012). For example, a person's belief that treatment is not necessary to reduce cannabis use is one of the most commonly reported treatment barriers among individuals who use cannabis regularly (at least weekly) (Gates et al., 2012). This belief generally stems from the fact that these individuals do not perceive their cannabis use as "harmful or out of control" (P. van der Pol, Liebrechts, de Graaf, Korf, Brink, et al., 2013b).

Subjective belief that cannabis use does not warrant treatment may be true in some cases as one previous study showed the prevalence of 'natural recovery' among a sub-group of individuals with cannabis use. Natural recovery, in this context, refers to a situation where an individual is able to recover from their cannabis problems without utilising benefits from any kind of treatment. In some cases, individuals arrive at a certain point in their life where they are able to quit or return to a safer level of cannabis use. A previous study measured frequency of cannabis use among individuals with long-term cannabis dependence and found that: at one year follow-up, one out of five users reduced their cannabis intake without any professional help (Swift et al., 2000). Authors concluded that cannabis use and dependence are somewhat stable among those who use cannabis for a long period of time. Remission is more likely to happen than incidence of dependence, in this sub-group. The most common reasons cited for decreased cannabis use in the sample were "boredom with smoking (35% of those who used less frequently), lack of money (23%), and change of life circumstances (20%)" (Swift et al., 2000 para 15).

Another commonly reported barrier to treatment-seeking is the stigma attached with seeking professional help (Hammarlund et al., 2018). Stigma can be defined as “negative attitudes and beliefs about a group of people due to their circumstances in life. It includes: discrimination, prejudice, judging, labelling, isolating and stereotyping” (Health Canada, 2018 para. 2). Perceived social stigma is a process in which the individual with CUD may feel embarrassed about their problem due to the stereotypical perception of drug use in the society (Hammarlund et al., 2018). In a review on effects of perceived social stigma among individuals with SUD, researchers conveyed that perceived social stigma may also serve as a barrier when healthcare providers display bias or judgement. In some cases, healthcare providers internalise the addiction problem and form a stereotypical opinion of these individuals, such as: individuals are less motivated to change, manipulative, and violent (Hammarlund et al., 2018; N. S. Miller et al., 2001). In other cases, perceived social stigma turns into self-stigma in which an individual accepts the stereotype about their problem, which leads into embarrassment and self-discrimination (Corrigan & Rao, 2012).

To conclude, there are a variety of factors which may influence treatment-seeking decisions of cannabis users and people with CUD. Some of the reported barriers are more common than others, nonetheless, one's own view of cannabis use, and stigma attached with substance use, may deter people from seeking treatment.

Gaps in knowledge and aims of the thesis

Despite having adverse health effects for some users, cannabis remains the most widely used illegal substance in the UK with 2.6 million adults using cannabis in 2019 (*Drug Misuse: Findings from the 2018 to 2019 CSEW*, 2019). Although treatments for cannabis have advanced in recent

years, there remains a notable scarcity of treatment uptake for those who might benefit from it. As discussed above there are several factors which contribute to low treatment uptake, nonetheless, an individual's own belief about their cannabis use, its associated harm, as well as their perceived social support and perceived treatment barriers may help us understand their treatment-seeking decisions. Very few studies, and none with regular cannabis users in the UK, have identified predictors of treatment-seeking decisions. Additionally, there is robust evidence of harm associated with regular cannabis use, however, little is known about individuals' own view about the nature of harm related to their use and whether it reflects on their treatment-seeking decisions. Lastly, cannabis is used in a social context; negative social support or unavailability of help from society or social entities has shown to be a significant barrier to treatment-seeking. From this perspective, it is important to understand the extent to which perception of social support influence treatment-seeking decisions.

Participation in psychotherapeutic treatment for cannabis is generally associated with positive outcomes, however, to achieve these benefits it is necessary for individuals with cannabis problems to utilise treatment in the first place. In addition to psychological characteristics of individuals and elements of their lifestyle, there are various treatment system factors which may serve as barriers to treatment. Some of the shortcomings of treatment design such as – absence of patient-determined success criteria for treatment (for example: reduction in use compared to complete abstinence); less focus on patient-centered perspective on treatment outcomes (for example: increasing self-efficacy through treatment); scarcity of short-term, easily accessible and less stigmatising treatment (for example: computer-based treatment) – may also act as barriers to treatment and influence treatment-seeking decisions. Perceived ineffectiveness of treatment, dissatisfaction with previous treatments and unsuitability of treatment programs to individuals'

needs are some of the common reasons given for not seeking treatment. These findings require further investigation about the effectiveness of cannabis treatment in the context of barriers to treatment-seeking. Increasing our understanding about characteristics of cannabis treatment trials may help in reducing treatment-seeking barriers, improving treatment retention rates as well as promoting meaningful changes through treatment.

In the light of the evidence discussed above, the overall aims of the thesis are to:

1. Recruit individuals with varying levels of cannabis use (e.g., low harm, hazardous and possible CUD) to investigate treatment-seeking preferences (e.g., formal or informal treatment) (Chapter 2).
2. Analyse the association between an individual's level of cannabis use, perception of harm of cannabis, extent of social support and barriers to treatment-seeking (Chapter 2).
3. Map out evidence pertaining to the effectiveness of psychotherapeutic treatment for cannabis use problems (Chapter 3).
4. Pool results from cannabis treatment trials reporting the frequency of cannabis use outcome for a meta-analysis.
5. Discuss findings from the overall thesis, provide clinical/therapeutical implications of the findings and direction for future studies (Chapter 4).

Chapter 2

Exploring why people do and do not seek treatment for Cannabis use: A survey of UK based regular cannabis users

Abstract

Background and Aims

Despite the growing use of cannabis, and negative consequences, there is low uptake of cannabis treatment. The aim of this study is to extend the existing knowledge of treatment-seeking decisions among individuals who: use cannabis at different degrees, are at various stages of dependence, perceive various extent of social support, and are experiencing different degrees of cannabis-related harm.

Method

An online survey method was utilised to recruit a convenience sample of 77 (aged between 18-55 years; 57% identified as male and 28.5% as female) self-identified cannabis users who currently live in the UK. Questionnaires measured levels of cannabis use (low harm, hazardous and possible CUD); Severity of Dependence (SDS); beliefs about the harms of cannabis (*Understanding the harms associated with legal and illegal drugs*, Nutt et al., 2010); perceived social support (MPSS); barriers to seeking treatment (*Barriers to treatment scale*, van der Pol et al., 2013); and past and future treatment uptake. Descriptive (means, standard deviation and percentages) and inferential statistics (Pearson's correlation coefficient, analysis of variance and regression analyses) were conducted to analyse the data.

Results

Most participants used cannabis 2-4 times a month. In the case of Possible Cannabis Use Disorder (PCUD), 38% of the population ($n = 30$) used cannabis 4 or more times a week. "Not having

confidence in treatment” was the most reported barrier. Nearly half of the sample (50.6%) responded that they would not seek any help, 25% would consider informal help and 22% would seek formal help in future. Individuals in PCUD group had a significantly higher ($p = .003$) average score on perceived harm as compared to those in other groups. Individuals who scored higher in perceived harm were more likely to choose formal or informal help as compared to no help. Whereas those who scored higher in perceived social support were less likely to seek formal help.

Conclusions

The major factors determining whether an individual will or will not seek treatment for regular cannabis use is their perception of cannabis-related harm, and the level of social support they currently have available to them. Nonetheless, negative views about treatment act as an important barrier to treatment-seeking and could be a point of intervention for those who are resistant to seeking treatment.

Introduction

As summarised in Chapter 1, there are several explanations for the social and biological dynamics of cannabis dependence and cannabis-related harm, as well as a wide range of treatment for cannabis use. Literature on barriers to treatment-seeking for cannabis problems have emerged and offer some explanations for lack of treatment uptake. However, little is known about what constitutes these barriers in the context of the general UK population. Latest prevalence statistics about cannabis use in the UK raise concerns about the lack of cannabis treatment utilisation in proportion to level of cannabis use. The prevalence of cannabis use in 2017/2018 in the UK “was the highest reported since 2008/09” (EMCDDA, 2019, p. 8). Cannabis was also the most commonly reported illegal substance in the context of lifetime use (*Adult Substance Misuse Treatment Statistics*, 2019). For the adult age group, cannabis was also the most common drug which was ever used at some point in individuals’ lifetime (around 1 in 3 adults) (Office for National Statistics, 2020). Moreover, cannabis also has highest proportion of frequent users compared to any other illegal substance (around one third of those who used cannabis, used it frequently, more than one time a month) (Office for National Statistics, 2020). In terms of treatment, in 2019, only 19% of individuals in SUD treatment were receiving treatment for cannabis, compared to 55% for opiates and 48% for alcohol (*Adult Substance Misuse Treatment Statistics*, 2019).

As mentioned earlier, cannabis remains illegal in the UK (classified as a Class B drug), however, regulatory changes in the favour of legalisation of cannabis across the world may have decreased individuals’ perception of cannabis harm and the need for treatment (Budney & Borodovsky, 2017). According to The Centre for Medical Cannabis voting poll, 59% of individuals aged 18 and above, support the legalisation of cannabis in the UK (*The Centre for Medicinal Cannabis*, 2019).

It could be argued that in popular public opinion cannabis is considered as a “less dangerous drug” (*The Centre for Medicinal Cannabis*, 2019). On this note, Budney et al., (2017) suggested that the popular recognition of cannabis as a “soft drug” may precede the use of “hard drugs”. Therefore, it becomes crucial for policy makers to target the early onset of problematic cannabis use and provide adequate help to reduce the risk of developing addiction to other drugs (Budney & Borodovsky, 2017). In addition to viewing cannabis as ‘less harmful’ than other drugs, another common barrier reported across all studies was “not perceiving the need for treatment” (Gates et al., 2012; P. van der Pol, Liebrechts, de Graaf, Korf, Brink, et al., 2013b). In cannabis literature, low levels of perceived treatment need are often explained by individuals’ frequency of cannabis use and severity of dependence. As described on page 37, a previous study examining remission among individuals with long-term cannabis use found that those who did not want to seek treatment had successfully quit on their own, as their cannabis use was already low before attempting to quit (Swift et al., 2000).

Social support plays an important role in determining individuals’ treatment-seeking decisions (P. van der Pol, Liebrechts, de Graaf, Korf, van den Brink, et al., 2013). As outlined in Chapter 1, having a large network of social connections is not considered as social support but knowing that these connections are meaningful, comforting, and available when needed. The direction of association between social support and cannabis treatment-seeking is most commonly explained by the notion that individuals are more likely to seek treatment when they recognise social connections as available, adequate and suitable for their needs (Gates et al., 2012). In other words, perception of social support (or perceived social support) acts as a facilitator to treatment-seeking (P. van der Pol, Liebrechts, de Graaf, Korf, Brink, et al., 2013b). Previous studies on barriers to treatment among people with cannabis dependence found that those with high social support

perceived less barriers to treatment (Gates et al., 2012). However, barriers have not been explored in the context of individuals with varying levels of dependence to cannabis.

Although several past studies have examined the role of social support in the context of facilitating treatment uptake, sometimes social support can have an opposite effect among those belonging to a drug subculture, as taking cannabis could be part of adhering to the group norm (Rapier et al., 2019). This phenomena could be explained from Simpson's paradox which states that the direction of relationship in the whole population could reverse within the subgroups of the population (Wang et al., 2018).

Application of the Health Behaviour Model (HBM) in cannabis literature

In health science, adaptation of a robust theoretical framework provides a comprehensive understanding of determinants of positive health behaviours (for example, treatment-seeking decisions in the current study) (Orji et al., 2012). Theoretical frameworks also provide information on the direction of relationship between the variables, and the extent to which these variables are related to each other (Orji et al., 2012). Within the field of health behaviour, *the Health Belief Model* (HBM) (Hochbaum et al., 1952) is the most commonly used theoretical framework to predict health behaviours (C. J. Jones et al., 2014). The U.S Public Health Service first adapted HBM as an attempt to understand the lower rates of disease prevention and screening admissions among US citizens (Champion & Skinner, 2008). However, HBM has been modified to be utilised in a diverse population. A previous study examining the validity of HBM in promoting self-examination of breast and mammogram screening for early detection of breast cancer, showed that HBM had a good internal consistency of *Cronbach's* $\alpha \geq 0.8$ (Mohamed et al., 2019). However, researchers used HBM components in the form of a questionnaire instead of a framework. The

foundation of original HBM (Hochbaum et al., 1952) is based on six variables: perceived susceptibility (subjective belief of vulnerability to negative health behaviour); perceived severity (perceived risk of negative health behaviour); perceived benefits (perceived overall benefit of reducing the negative behaviour); perceived barriers (perceived barriers to positive behaviour change); cue to action (stimulus that encourages to adapt positive behaviour); and self-efficacy (belief that one can achieve a positive outcome by self-reliance).

Although HBM constructs (when taken together) have shown to adequately predict health behaviour, there is a large variation in regards to how these constructs are utilised and how they are related to each other (C. L. Jones et al., 2015). Several studies in the past have examined an individual construct or set of constructs from HBM as independent variables (independently associated with the outcome variable) (Champion & Skinner, 2008). Perceived barriers and perceived severity, which are the two major constructs of HBM, have consistently been used across many health behaviour studies (C. L. Jones et al., 2015). On the other hand, perceived benefits construct of HBM is used with caution in SUD, mainly due to its oversimplified definition: “the person would accept the recommended health action if it was perceived as beneficial.” (*The Health Belief Model*, 1974, p. 22). Believing something to be beneficial would not cause individuals to act unless that belief is turned into a motive (for example, a desire) to do so (West & Brown, 2013).

There is no consensus about the use of HBM variables in cannabis literature, however, one previous study about factors contributing to cannabis use and treatment outcomes, applied an integrated model approach using the following: HBM, the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), and Social Cognition Theory (SCT). The study concluded that attitudes and beliefs about cannabis use (for example, cannabis is not harmful or harmful) play a more important role in reasons to use cannabis than societal norm or self-efficacy (Sayeed et al.,

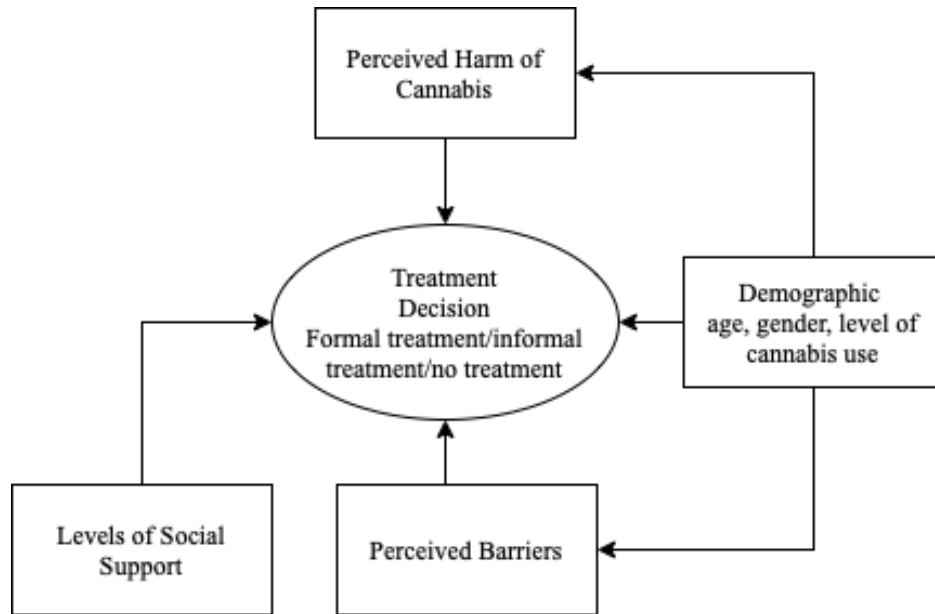
2005). Similarly, another study combined the perceived severity construct of HBM with the bioecological model (based on the theory that different layers of ecological systems in individuals' life attribute their development) to assess health risk behaviour of legal and illegal substance use including cannabis (Fleary, 2009). The study found that risky behaviour, such as cannabis use, is associated with the risk perception of cannabis, which in turn is influenced by individuals' interpersonal interactions from their immediate surroundings. Similarly, in previous cannabis treatment-seeking studies (without HBM framework), authors found that individuals' subjective barriers to treatment (for example, treatment is not required for me) and the perception of harm (for example, cannabis is not harmful) were the best predictors of seeking treatment (Budney et al., 2007a; Gates et al., 2012). Since perceived severity and perceived barriers have been the most widely used variables in cannabis literature, the current study utilised these two variables from the HBM to predict treatment-seeking decisions.

Although the HBM is the most commonly used framework for predicting health behaviour, it is an individual-focused model and has received criticism for not considering the social context (Jeihooni et al., 2016). For example, the HBM assumes individuals are likely to follow a particular behaviour if they think they are vulnerable to a certain health condition, and consider this condition to be dangerous (Taylor, 2007). These two factors presumably work together in predicting health actions, however, in reality, effects of these two factors can be modified by various other factors such as individual differences, social pressure/support or demographic variables (e.g., ethnicity); which are not taken into consideration. Thus, rigidity of HBM model may inaccurately "suggest that health behaviours can always best be understood as being under volitional control, rather than in a large part determined by combinations of circumstantial reality and individuals habitual,

emotional, unconscious and/or otherwise non-rational reactions to the external world” (Taylor, 2007 para. 11).

In the present study, social support variable (which plays a superior role in both treatment-seeking and recovery) was examined as an independent variable along with other variables from the HBM to predict treatment-related decisions (for example, “Yes, I will consider formal treatment in future”). Additionally, the level of cannabis use was also considered as an independent variable to assess if individuals with different levels of cannabis use differed with respect to their treatment-seeking decisions. Finally, to examine the level of help-seeking individuals preferred in past and future, study questionnaire adapted the following variables from cannabis literature: *formal help* (evidence-based support or intervention provided by health care professionals); *informal help* (help/support provided by social support network; family or community) and no help. For the reason that formal help typically constitutes formal treatment delivered by health care professionals using evidence-based approaches; words such as “formal help” and “formal treatment” are used interchangeably throughout this chapter. Figure 1. presents the diagram of the theoretical model produced for the current study based on the background literature reviewed in this chapter.

Figure 1. Theoretical model of the current study based on HBM



Aims

The current study aims to explore the following:

1. Measure individuals' levels of cannabis use (low harm, hazardous or possible CUD), severity of dependence on cannabis, perceived social support, perceived barriers to treatment and the extent to which they see cannabis as harmful.
2. Measure the percentage of people who have ever sought treatment or help for cannabis use and their decisions to seek treatment (formal/informal) in the future.
3. Evaluate whether level of cannabis use, perceived harm of cannabis, perceived barriers to treatment and social support will predict individuals' decision to seek treatment. It is hypothesised that higher level of cannabis use, higher perceived harm, higher social support and fewer barriers will predict treatment-seeking.

4. Assess the link between how harmful a person believes cannabis to be and their decisions to seek formal/informal/no treatment. It is hypothesised that participants who believe cannabis is harmful will be more likely to engage in treatment than no treatment.
5. Examine the association between perceived social support and the level of cannabis use. It is hypothesised that participants scoring low in social support will have higher levels of cannabis use.
6. Measure the relationship between the level of cannabis use and treatment-seeking decisions. It is hypothesised that individuals with low levels of cannabis use are more likely to not seek treatment.
7. Assess if individuals with different levels of cannabis use differ with respect to their perceived harm of cannabis. It is hypothesised that individuals with low levels of cannabis use will perceive cannabis use as less harmful.

Methods

Ethical approval

The study received ethical approval from the Division of Psychiatry and Applied Psychology ethics committee (Reference Number: DPAP-2019-0345-3). The study adhered to the Code of Research Conduct. During the initial ethical review, the committee asked us to consider how the confidentiality of participants would be ensured when advertising a study about illegal behaviour on social media. Study advertisements were initially worded to target self-identified regular cannabis users, therefore disclosing an illegal activity. To solve this issue, the study advertisement was reworded as “do you want to participate in a study about cannabis?”. The advertisement

wording was kept consistent for Twitter advertisement and Reddit. As such, participants did not have to self-identify as a current cannabis user until following the link to the online survey platform, and out of Facebook. Furthermore, at the beginning of the survey, the potential risk involved with clicking on the Facebook advertisement was explained and a link for more information about how Facebook collects data and Facebook data usage policies was provided. In addition, at the beginning of the online survey, participants were displayed an information sheet ensuring they were fully informed about the nature (being sensitive, having advantages/disadvantages) of the study. Participants were also informed about the potential psychological risks (due to the sensitivity of cannabis use) involved with the survey, the right to participate and the right to withdraw from the survey at any point. Participants were ensured that their confidentiality and anonymity will be protected to the best of our ability. Whether they consented to take part in the survey or not, participants were offered supportive links regarding cannabis use and available treatment (on Participant Information Sheet).

Participants

Participants consisted of a convenience sample of self-identified current cannabis users living in the UK. The study sample included both men and women. Eligible respondents needed to be aged between 18 and 55 years, have used cannabis at least once in the last 3 months and be a resident of the UK. Participants of this age group (aged 18-55) were included because in the UK there were 10,666 adults who started substance abuse treatment in 2017 to 2018. The majority of these had problems with cannabis (Public Health England, 2018).

Materials and Measures

A very broad literature search was conducted to identify instruments available to assess HBM, social support and demographic constructs in the context of regular cannabis use. Instruments with established results for cannabis, good indicators of validity and reliability were selected for the current study. All available instruments were published in books or articles and were written in English; therefore, the authors were not contacted for further information. Language considerations was not of major concerns as the target population was individuals with regular cannabis use living in the UK. However, special attention was given to explain constructs such as “treatment-seeking” and types of treatment (“informal help, “formal help” and “no help”) in the survey. Further, there were no available scales to measure barriers to treatment-seeking for cannabis and perception of harm associated with cannabis use. Thus, the current study adapted 14 open-ended questions from Pol et al., (2013) study, in which the authors asked why individual (with cannabis dependence) would not seeking treatment. Similarly, the present study revised Nutt et al., (2010) questionnaire for cannabis use only, to measure a person’s ideas about the harms of cannabis. A detailed description of the properties of these scales are provided below.

An online questionnaire research method was used to collect information about the target population. JISC Online Survey (the Joint Information Systems Committee) used to collect data. The format consisted of an information sheet; consent form; screening questions (“are you over 18” and “have you used cannabis in the last three months”; and “do you live in the UK?”); demographic questions (country currently residing, county, age, gender, employment status, level of education and living situation); treatment specific questions (“have you ever sought help for cannabis-related problems” and “would you consider seeking treatment in the future?”); and four standardised questionnaires: Cannabis Use Disorder Identification Test [CUDIT-R, (Adamson et

al., 2010)]; Severity of Dependence Scale [SDS, (Gossop et al., 1995)]; Multidimensional Perceived Social Support scale [MPSS (Zimet et al., 1988)]; and Understanding the Harm associated with Illegal and Legal drugs [(Nutt et al., 2010)]). Additionally, the online questionnaire consisted of one adapted questionnaire on barriers to treatment-seeking from van der Pol et al., (2013) study and a debriefing sheet. Skip logic was used if participants selected that they were under 18, had not used cannabis in the last three months, or were living outside of the UK. These participants were taken to the debriefing page.

Measures

The following questionnaires were used in the study:

1. *The Cannabis Use Disorder Identification Test-Revised*, CUDIT-R (Adamson et al., 2010): CUDIT-R questionnaire is based on DSM-IV diagnostic criteria of cannabis dependence and abuse (see Chapter 1). Previous studies have evaluated CUDIT-R in parallel to DSM-V diagnostic criteria (which combines both abuse and dependence factors into one diagnostic criteria) for CUD and found a good internal consistency (Cronbach's alpha = 0.91) (Adamson et al., 2010). The scale contains 8 items, two each from the domains of consumption (for example, "*How often do you use cannabis?*"); cannabis problems (for example, "*How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?*"); dependence ("*How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis?*"); and psychological factors (for example, "*Have you ever thought about cutting down, or stopping, your use of cannabis?*"). The scale has been widely utilised to measure the pattern of cannabis use and detect whether it is classed as *low harm* (score

between 1-7), *hazardous* (8-11) or *possible cannabis use disorder* (PCUD, 12 and above). CUDIT-R showed internal reliability of Cronbach's α .81 for the current analysis.

2. *Severity of Dependence Scale, SDS* (Gossop et al., 1995): SDS is a 5-item questionnaire which primarily focuses on the “psychological dependence” or “compulsive use” aspects of cannabis dependence. Each of the five items (for example, “*Did you ever think your use of cannabis was out of control?*”) are scored on a 4-point scale (0-3). The total score is obtained by adding ratings across all 5 items. The current study utilised SDS to assess the level of psychological dependence among individuals with cannabis problems. For cannabis, SDS uses dependence criteria of *DSM-IV*. The most appropriate cut-off score to detect cannabis dependence is shown to be 4 or above, with high internal consistency ($\alpha = 0.83$) and test-retest coefficients (*ICC* - 0.88) (Martin et al., 2006). The Cronbach alpha for this study was .80.

3. *Understanding the harms associated with legal and illegal drug* – revised cannabis only: This scale was revised for the current study (Nutt et al., 2010). The original version assessed harm associated with a range of illegal and legal substances (Alcohol; Heroin; Crack cocaine; Metamfetamine; Cocaine; Tobacco; Amfetamine; Cannabis; GHB; Benzodiazepines; Ketamine; Methadone; Mephedrone; Butane; Khat; Anabolic; steroids; Ecstasy; LSD; Buprenorphine; and Mushrooms) and whether this harm justified the classification of drugs in the UK (according to Misuse of Drugs Act) in 2007. In an attempt to inform policy makers decision, the scale encapsulated three dimensions of harm (physical, psychological, and social harm) associated with each substance/drug. The questionnaire consisted of 16 different harms items covering all three categories of harm (for example, “*What is the risk of becoming addicted to cannabis?*”). The original

questionnaire was scored with points out of 100 in the scale of “*no risk* = 0”, “*some risk* = 1”, “*moderate risk* = 2” and “*extreme risk* = 3”, with 100 scored for the most harmful substance on a particular criterion. Including all these substances was out of the scope of the present study, but the questions tapped into some interesting ideas about different types of perceived harm about cannabis. Thus, the current study adapted the questionnaire to only measure a person’s ideas about the harms of cannabis (for example, “*What is the risk that using cannabis will cause the user to have mental health problems?*”). In the current study, questionnaire had 16 items and was scored in a 4-point scale consisting of “*no risk*”, “*some risk*”, “*moderate risk*” and “*extreme risk*”. The score in the range of 1- 15 indicated “*low harm*”, 16 - 32 “*moderate harm*”, 33 - 48 “*high harm*”. The validity measures for this modified scale were assessed for future use and presented in the results section.

4. *Multi-dimensional Scale of Perceived Social Support*, MSPSS (Zimet et al., 1988): MSPSS is a well-established and widely utilised scale to measure perceived social support. The scale has 12 items and three subscales, each addressing a different source of support: family (“*My family really tries to help me*”), friends (“*I can count on my friends when things go wrong*”) and significant other (for example, “*There is a special person who is around when I am in need*”). Each item in the scale is scored on 7 points: “*very strongly agree*”, “*strongly agree*”, “*mildly agree*”, “*neutral*”, “*mildly disagree*”, “*strongly disagree*” and “*very strongly disagree*”. After dividing the respondents into friends, family and significant other groups, cut-off points of MSPSS are in the range of 1-2.9 for *low support*, 3-5 *moderate support*, 5.1- 7 *high support*. The scale has a good internal consistency of Cronbach’s α of 0.91 and the intraclass correlation coefficient (ICC) of 0.84 (Wongpakaran et al., 2011). The Cronbach’s α was .86 for the current study.

5. Previous experience and future choice concerning treatment/help for cannabis use: the study created two questions (“*Have you ever sought help for cannabis-related problems?*” and “*would you consider seeking help in future?*”), answered with three response options (“seek formal help” or “seek informal help” or “not seek any help”). Participants were given guidance notes to help them answer the question. Help seeking was defined as an attempt to find (seek) assistance to improve a situation or problem. As described on page 49, informal help was defined as assistance from informal social networks, such as friends and family. Formal help was defined as support/intervention provided by health care professionals (for example: doctors, health care workers). Additionally, it is to be noted that, the second item of this scale (“would you consider seeking help in future”) was optional.
6. *Barriers to treatment scale*, Pol et al., (2013): In a Netherlands-based study on treatment barriers and facilitators among individuals with cannabis dependence, authors used open-ended questions to measure lack of perceived treatment need in the sample. Since there was no standard questionnaire available in the literature to examine treatment barriers specific to cannabis, the current study adapted 14 open-ended questions (e.g “*I think treatment is ineffective?*”) from Pol et al., (2013) study. The items in the questionnaire were scored on 5-point Likert scale “*strongly agree* = 4” “*agree* = 3” “*unsure* = 2” “*disagree* = 1” and “*strongly disagree* = 0”. A score in the range of 0-18 indicated *less barriers*, 19-36 *moderate barriers* and 37 and above *high barriers*. The validity measures for this scale were assessed for future use and presented in the results section.

Questionnaires took approximately 25 minutes to complete. This was clearly indicated to participants on the information sheet.

Procedures

How access to participants was gained

Primarily, participants were recruited from Facebook using a paid advertisement for four months. As described on page 52, participants consisted of a convenience sample of self-identified individuals with current cannabis use living in the UK.

For the purpose of study advertisement, an individual page on Facebook was created. A paid advertisement method was used, and the study was advertised for four months. The audience filter (adhering to study inclusion criteria) was customised for ages 18-55 and a current UK resident. Facebook also allowed users who saw the advertisement to share it with others in their circle who met the above criteria. The advert was live for 121 days with a budget of £1 per day. A secondary recruitment method was used to advertise the study via the Institute of Mental Health Twitter feed. Advertising on personal social media pages was not used for this study.

The advertisement image, on Facebook, displayed “do you want to participate in a study about cannabis?” (see Appendix G). Participants who were interested in taking part in the study could click on the link to the survey which took them to the participant information sheet depicting the full details of the study. After giving online consent, participants were instructed to fill out three screening questions (skip logic took them to the end of the survey if they responded with “no” to any), demographic questions (for example: gender, age, occupation, where they lived, who they lived with) and six questionnaires (pages 54-57). Once the data was collected, a debriefing section displayed consisting of the details of the study and the link for seeking help.

Additionally, a post within Reddit was created to gain additional participants. A survey related subreddit (established by research community) was used to advertise the current study. Adhering

to the subreddit rules, a tag "[Academic]" was added along with an appropriate post title, and intended demographic.

Justification of sample size

A priori power analysis using *G-Power* (Version 3.1) was conducted to determine the correct sample size of the study to achieve the maximum power. Power refers to the likelihood of rejecting the null hypothesis (H_0) and achieving a statistically significant result (α) when the alternative hypothesis (H_a) is true (Cohen, 1988). For example, in the current study, it was hypothesised that people who preferred to seek informal help/formal help/no help in future, may differ with respect to their perceived level of harm of cannabis. The estimate of the effect size was informed by the literature. Pol et al., (2013) reported moderate effect for cannabis use outcomes and treatment determinants among non-treatment seekers in the community. The study estimated the power at .80 to achieve a sample size so that there was 80% chance of rejecting the null hypothesis assuming that the projected effect size was correct. The effect size convention was set at .25 (Cohen's f) for a medium size effect (Cohen, 1988) and α level was at .05. The result from the G-Power analysis depicted a sample size of 159 participants with 53 participants in each treatment-seeking group (formal help, informal help and no help), to achieve acceptable power.

Statistical analysis

After exporting data from JISC, "*Smart Filters*" functionality within Google Sheets was used to organise the information dynamically (based on the table headers). For example, participants could be organised via age when filtered alpha-numerically within the age column. A conditional formatting method was utilised to understand which participants were removed from the initial 3 question exclusion criteria (sufficient age to participate, based in the UK and actively used

cannabis). If participants answered incorrectly the row would highlight red, therefore ensuring the results were filtered within the dataset.

All statistical analysis was performed using the *SPSS* Version 26. For descriptive data, percentage values were displayed for categorical variables, whereas mean and standard deviations were reported for continuous variables. To check assumptions for normal distribution for all parametric tests, Skewness and Kurtosis values were calculated. The values were within the range of |2| (Skewness) and |7| (Kurtosis), therefore data was considered as normally distributed. Similarly, assumptions of linearity were evaluated for the Pearson correlation test using the scatter plot, the results are presented in the result section.

For the purpose of between-group analyses, CUDIT-R scores were divided into three levels as per the cut off score guidelines: low harm (0-7), hazardous (8-11) and PCUD (score of 12 or more indicated possible CUD). A 3 x between group one-way ANOVA analysis was used to examine the mean differences in two groups: levels of cannabis use (low harm, hazardous and PCUD) for perceived harm of cannabis (maximum score was 48); and treatment-related decisions (seek formal help, seek informal help, and not seek any help) for perceived harm of cannabis.

A Chi-square test for independence was used for comparing categorical variables (CUDIT-R levels and future treatment-seeking decisions). Pearson correlations tests were utilised to examine relationships between continuous variables (e.g., social support, severity of dependence, perceived harm, perception of social support, and subjective barriers to treatment scores).

Multinomial logistic regression was performed to assess the probability of independent variables (level of cannabis use, perceived harm, social support, and barriers to treatment) to predict the membership of a categorical dependent variable (seek formal treatment, seek informal help, and

not seek any help). All independent variables were used as continuous variables with an exception of levels of cannabis use. Levels of cannabis use (low, moderate and PCUD) variable was characterised as a categorical variable using CUDIT-R scoring guidelines. In addition, Cronbach's α measure of reliability was used to determine the internal consistency of perceived barrier and perceived harm questionnaires. A Cronbach's alpha analysis was considered suitable for this purpose, as the scales are Likert type and the items in the scale are independent to each other. Furthermore, a convergent validity test was performed between individuals' scores on barriers to treatment-seeking scale and their treatment preferences in past and future.

Results

Sample characteristics

Ninety-seven individuals participated in the survey. Seventy-seven participants of the sample (80.2%) completed the survey in full and 19 (19.7%) did not meet the inclusion criteria and were therefore removed automatically from the survey. One participant had missing data (1.2%) on treatment-seeking decision questions. Missing data occurred at an item non response level for the question which was not indicated as compulsory to answer (without a red asterisk), in the survey. Since missing rates of 5% or less is insignificant, the study kept the scores of that participant without imputing the missing data (Dong & Peng, 2013).

The average age of participants in the final sample ($N=77$) was 29 years ($SD = 8.1$). Fifty seven percent of the sample ($n = 44$) identified as male and 28.5% identified as female ($n = 22$). Eight participants (10.3%) did not provide their gender ("*preferred not to say*"), whereas 3 participants (3.8 %) preferred to self-identify without specifying their preferred gender identity.

Among participants, 36.3% had a university degree ($n = 28$), 19.4% higher/NVQ/SVQ ($n = 15$), 18.4% national diploma ($n = 14$), 16.8% GCSE/O Level ($n = 13$) and 9% had a postgraduate degree ($n = 7$). The current employment status of the sample was recorded as: 35% were employed for wages ($n = 27$), 16.8% students ($n = 13$), 14.2% out of work but looking ($n = 11$), 9% self-employed ($n = 7$), 9% unable to work ($n = 7$) and 7.7% in military services ($n = 6$). Three participants identified as homemakers and the remaining 3 were out of work but not looking.

At the time of the survey, 25% of the sample reported that they lived with no one ($n = 20$), followed by 23.3% lived with their partner ($n = 18$), 16.8% with their friends ($n = 13$) and 11.6% in a shared accommodation ($n = 9$). Four participants (5.1%) lived with their own children. The remaining 6 of them lived with their mother ($n = 1$), other non-relatives ($n = 1$), Step-mother/father's partner ($n = 1$), Brother/sister(s) ($n = 1$), Step-brother/sister(s) ($n = 1$) and Other relative(s) ($n = 1$). The full details of sample characteristics are provided in Table 1.

Table 1. Sample characteristics displayed by their level of cannabis use (CUDIT-R category)

		Low Harm ($n=23$)	Hazardous ($n=24$)	PCUD ($n=30$)	<i>p</i> Value
N Count	Male	14	13	14	.76
	Female	7	8	7	
	Prefer not to say /Prefer to self- identify	2	3	6	
Mean & Standard	Age	26.39(6.08)	29.04(8.54)	30.30(9.02)	.22
	Perceived Harm of	15.04(9.31)	19.54(6.19)	23.10(7.66)	.001*

Deviation scores	cannabis				
	CUDIT-R (Total)	5.04(1.74)	9.83(1.12)	15.87(5.03)	N/R
	MSPSS (Total)	4.51(0.84)	4.25(0.48)	4.08(0.74)	.09
	Perceived Barriers	32.57(6.68)	31.92(6.20)	31.33(6.81)	.79
	SDS (Total)	2.39(2.08)	4.67(2.39)	6.07(2.58)	<.001**
Treatment seeking/non seeking decisions (Count)	Informal	3	1	19	.01*
	Formal	7	7	10	
	No-help	10	9	10	

At $*p < 0.05$ and $**p < 0.001$ for group comparison. Mean, standard deviation and count are presented. N/R = not required.

Level of cannabis use in the total sample

CUDIT-R cut-offs were utilised to identify levels of cannabis use (low harm, hazardous or PCUD) among participants in the last six months. Overall, participants scored a mean of 8.6 ($SD = 5.60$) out of 32 indicating hazardous cannabis use. Thirty eight percent of the sample scored 12 or above ($n = 30$) which implies PCUD.

For SDS, overall participants scored a mean of 3.6 ($SD = 2.80$) out of 15. However, 63.6% of the sample ($n = 49$) scored 4 or more indicating psychological dependence on cannabis. To the question “*Did you ever think your use of cannabis was out of control?*”: 62.3% respondents replied “*sometimes*” and 28.5% answered “*never or almost never*”. To the same question 5 participants answered “*often*” and 2 of them marked “*always or nearly always*”. Additionally, upon asking

“*did you wish you could stop*”, 49.3% responded “*sometimes*”, 31.1% “*never or almost never*”, 16.8% “*often*” and 2 participants ticked “*always or nearly always*”.

Social Support

The average total score on MSPSS for all participants was 3.41 ($SD = .72$) out of 7. In addition, on average participants scored 3.3 ($SD = .90$) in significant other, 3.4 ($SD = .91$) in family and 3.4 ($SD = .83$) in friend subscales.

Perceived harm and reliability of revised scale

Participants scored an average of 15.7 ($SD = 8.38$) out of 48. A score in the range of 1-15 indicated “*low harm*”, 16-32 “*moderate harm*”, 33-48 “*high harm*”. A Cronbach’s alpha measure of internal consistency was conducted to assess perceived harm scale (Nutt et al., 2010) consisting of 16 items. The results are presented in Table 2.

Table 2 - Mean and standard deviation of each item in “Understanding the harms associated with legal and illegal drugs” Scale (Nutt et al., 2010) modified for this study to ask only about cannabis

Question	Mean	Std. Deviation
What is the risk that taking an overdose of cannabis will be fatal?	.68	.572
What is the risk of cannabis causing the user’s death other than by overdose?	.90	.836
What is the risk that use of cannabis will cause direct damage to the physical health of the user? For example, suffering from a chronic	1.14	.790

illness due to the drug use.

What is the risk that the use of cannabis will result in unintentional damage to the user's physical health? For example, an injury due to the use of cannabis or losing self-control whilst under the influence of the drug	1.14	.683
What is the risk of becoming addicted to cannabis?	1.48	.852
What is the risk that using cannabis will cause the user to have mental health problems?	1.53	.771
What is the risk that the use of cannabis may result in problems in the users social/work life which can then lead them to have mental health problems?	1.35	.791
What is the risk that the use of cannabis will result in the loss of material possessions and status for the user e.g., loss of income, housing, job?	1.18	.807
What is the risk that the use of cannabis will result in loss of relationships with family and friends in the user?	1.43	.696
What is the risk that the use of cannabis will result in injuries to other people?	1.29	.901
What is the risk that the use of cannabis will lead to an increase in criminal behaviour in the community to fund the users' habits?	1.27	.853
What is the risk that the use of cannabis will cause damage to the local environment?	1.17	.923
What is the risk that the use of cannabis will cause problems in the user's family?	1.44	.734
What is the risk that the use of cannabis in this country will result in economic, social or environmental problems in other countries where cannabis is produced?	1.06	.817
What is the risk that use of cannabis will have a negative impact on the economy of this country as a whole for example through increased health care costs to the drug user, loss of productivity and absenteeism at work?	1.12	.873

What is the risk that the use of cannabis will result in the decline of happiness and quality of life in the community as a whole?	1.40	.892
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Cronbach's $\alpha = .90$ showed good reliability of the scale. Inter-item correlation matrix showed that most items in the scale had an acceptable correlation (r higher than .30) with the overall questionnaire score. None of the items would increase α value, therefore removal of items was not considered.

Barriers to treatment and reliability of revised scale

For barriers to cannabis treatment, participants scored an average of 25.5 ($S.D. = 6.52$) out of 56. A score in the range of 0-18 indicated *less barriers*, 19-36 *moderate barriers* and 37 and above *high barriers*. The reliability of barriers to treatment scale was assessed for future use. A Cronbach's alpha measure of reliability was used to assess the internal consistency of this scale. The item statistics are presented in Table 3.

Table 3. Mean and standard deviation of each items in Barriers to treatment scale
(Van der Pol et al., 2013) adapted for this study from their open-ended questions

Question	Mean	Std. Deviation
I think treatment is ineffective	2.10	.897
I want to avoid stigma attached with seeking treatment	2.39	.876
I think treatment is not for me	2.29	.998
I think treatment is the last resort	2.26	.849
I think treatment is not tailored to my symptoms	2.48	.788
I think treatment is only for severe cases	2.38	.960
I think my problem would resolve spontaneously	2.22	.927

I have already received help from another health professional	2.16	.988
I think nobody could help me	2.10	.736
I don't have time for treatment	2.44	.966
I have no confidence in treatment services	2.55	.925
I have problems that resolved themselves without treatment	2.31	.936
I am worried about family/friends' opinion	2.14	.996
I am unaware of treatment options	2.06	.964

Cronbach's α value of .70 showed that the scale had an acceptable reliability. *The Corrected Item - Total Correlation* results showed that each item correlated with r value higher than .30 with the overall questionnaire score, in other words, all items in the scale appeared to belong in the scale. In addition, *Cronbach's Alpha if Item Deleted* results did not show an increase in alpha value if an item is removed from the scale, therefore deleting items from the scale is not suggested.

Past and future treatment seeking/non-seeking

In answer to the question if participants ever sought help for cannabis-related problems, 70.1% ($n = 54$) of all participants answered that they had never sought any help, 15.5% ($n = 12$) received informal help (e.g., help from family) and 14.2% ($n = 11$) sought formal treatment (for example: professional help from a therapist).

For treatment-seeking choice in future, 50.6% ($n = 39$) stated they would not seek any help, 25.9% ($n = 20$) would consider informal help, and 22% ($n = 17$) would seek formal treatment (e.g., professional help from a therapist).

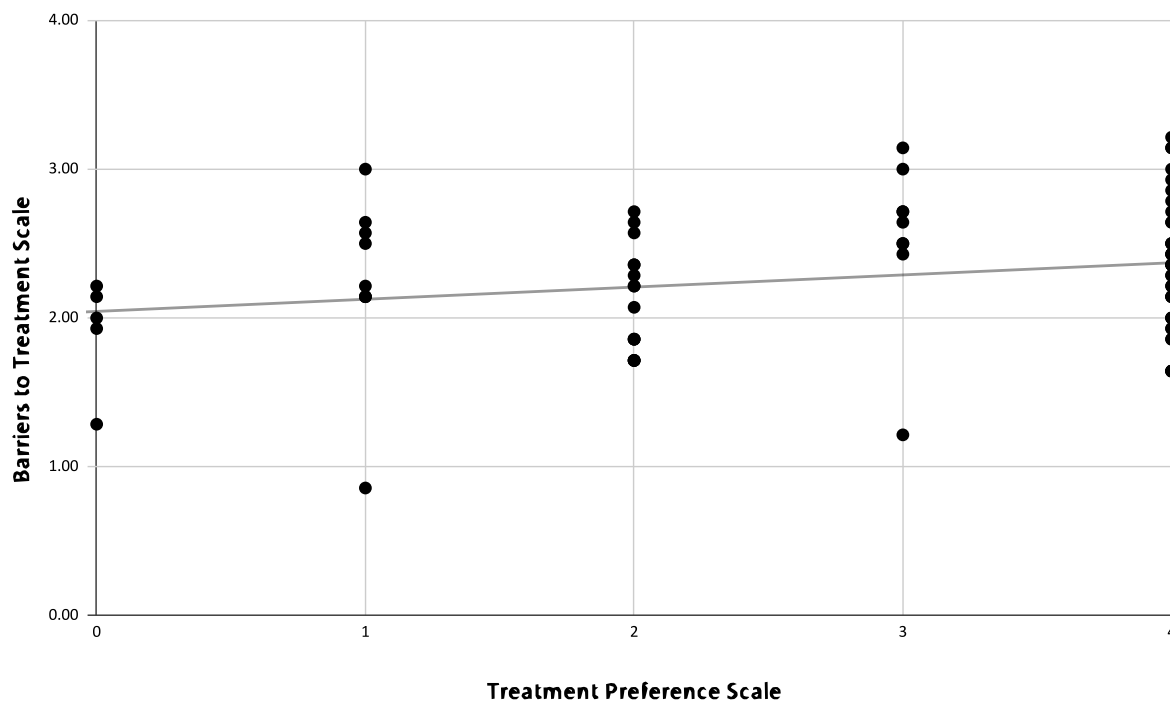
Of 14.2% participants ($n = 11$) who sought formal treatment in the past, 45% reported ($n = 5$) that they will consider formal treatment, 36.3% ($n = 4$) may seek informal help and 18.1% ($n = 2$) may

not seek any help in future. In case of problematic cannabis use; out of 30 participants (in PCUD group), the majority 63.3% ($n = 19$) had not sought any help for cannabis problems in the past, 20% ($n = 6$) sought informal help, and 16.6% ($n = 5$) sought formal treatment.

Validity test of Barriers to Treatment Scale

Convergent validity was conducted to measure the level to which participants' scores in barriers to treatment scale correlated with their responses in past/future treatment-preference scale. A composite variable was created for both the Barriers to Treatment Scale (with 14 items) and the treatment-preference scale (with 2 items), which represented the individual mean scores of each participant of all items in the scales. Before conducting a Pearson's r test, two variables were checked for linearity by drawing a scatter plot. The relationship appeared to be linear and positive. A Pearson correlation coefficient was computed, and the results showed that there was a significant positive relationship between barriers to treatment and treatment preference scale: ($r = .232, p = .042$). However, the relationship was weak. Overall, an increase in the scores of barriers to treatment scale (for those who perceived more barriers to treatment) was associated with preference for not seeking treatment and decrease in the scores of barriers to treatment scale was correlated with preference for a treatment in past and future.

Figure 2 - Simple scatter of Barriers to treatment scale and treatment preference scale



Level of cannabis use, perceived harm, perceived barriers and social support to predict treatment-seeking decisions past and future

A multinomial logistic regression was performed to evaluate whether levels of cannabis use, perceived harm of cannabis, perceived barriers to treatment and social support scores predicted an individuals' decision to seek treatment in future. The dependent variable had three categories: “seek formal treatment”, “seek informal help” and “not seek any help”. Among the independent variables, perceived harm, barriers to treatment and social support scores were continuous whereas levels of cannabis use (with three levels: low harm, hazardous and PCUD) was a categorical variable. *The model fitting table* comparing the study's model to the null model (or intercept only

model, $x = 0$), showed a statistically significant value indicating that the model represents a significantly improved fit as compared with the null model: $\chi^2(10) = 42.02, p < .001$

Additionally, the *goodness of fit* table showed that the model exhibited good fit to study data. Pearson chi-square test was $\chi^2(140) = 126.76, p = .78$ whereas the Deviance chi-square was $\chi^2(140) = 114.33, p = .94$

The *pseudo* χ^2 measures for the current analysis were provided by Cox and Snell (.42), Nagelkerke (.48) and McFadden (.26). The pseudo- R^2 values in logistic regression are not equivalent to the R^2 values (to explain the variance in data) interpreted in Ordinary least squares (*OLS*) regression. It is primarily used to compare multiple models fit to the same dataset; therefore, it was not interpreted for the current study.

The likelihood ratio tests provided the overall contribution of each independent variable to the model. At a conventional $\alpha = .05$, perceived harm ($p = .002$) and social support ($p = .034$) were the significant predictors in the model. Level of cannabis use was near significant ($p = .055$), whereas barriers to treatment was not significant ($p = .625$).

Since the primary interest of the research is to analyse treatment-seeking decisions (formal/informal) as compared to non-treatment seeking, “Not seek any help” was entered as a reference category to draw a comparison with “seek formal treatment” and “seek informal help”. The interpretation in terms of odds ratios for each variable to predict treatment-seeking decisions is provided in Table.4.

Table 4. Estimated Parameters, Standard Errors, and Wald Test Statistics

Odds	Effect	Std.		Wald	Sig.	Exp(B)
		B	Error			
P(Y _i = seek informal help)	Intercept	-1.691	3.160	.286	.593	
P(Y _i = not seek any help)	Perceived harm	.146	.056	6.827	.009*	1.157
	Barriers to treatment	-.006	.051	.014	.907	.994
	Social support	-.323	.533	.369	.544	.724
	[Level of cannabis use=1]	-1.275	.839	2.308	.129	.280
	[Level of cannabis use=2]	.228	.756	.091	.763	1.256
	[Level of cannabis use=3]	0 ^b	.	.	.	.
P(Y _i = seek formal help)	Intercept	3.619	4.047	.800	.371	
P(Y _i = not seek any help)	Perceived harm	.184	.076	5.885	.015*	1.202
	Barriers to treatment	-.055	.062	.789	.374	.946
	Social support	-1.570	.703	4.983	.026*	.208
	[Level of cannabis use=1]	-2.536	1.397	3.296	.069	.079
	[Level of cannabis use=2]	.854	.893	.914	.339	2.348
	[Level of cannabis use=3]	0 ^b	.	.	.	.

Note. Levels of cannabis use- low harm, hazardous and PCUD- coded as 1, 2 and 3 respectively.
Exp(B) = odds ratios for the predictors. Showing significance at * $p < 0.05$

The parameter estimates results showed that perceived harm was a significant predictor of seeking informal treatment ($b = .146$, $s.e. = .056$, $p = .009$). In other words, those who believed cannabis was more harmful were more likely to seek informal treatment than no treatment. The odds ratio of 1.157 indicates that for every 1 unit increase in perceived harm, the odds of individuals seeking informal treatment as compared to no treatment, increases by a factor of 1.157 (15.7%).

Perceived harm was also a significant predictor of seeking formal treatment over no help ($b = .184$, $s.e. = .076$, $p = .015$). Individuals who believed cannabis was more harmful were more likely to look for formal treatment as compared to no help. The odds ratio was 1.202, which means for every 1 unit increase in perceived harm, the odds of individuals looking for formal treatment as compared to no treatment, increases by a factor of 1.202 (20.2%).

Additionally, social support, in a negative direction, was a significant predictor of the decision to seek formal treatment as compared to no help ($b = -1.570$, $s.e. = .703$, $p = .026$). Those who perceived better social support were less likely to seek formal treatment as compared to no help. The odds ratio of .208 indicates that as social support increases by a unit, the odds of seeking formal treatment as compared to no treatment, decrease by .208 units (79.2%).

The classification table showed which group membership was best predicted by the model. Individuals who preferred to seek informal help were correctly predicted by the model 50% of the time (for example 10 out of 20 people who actually preferred to seek informal help were predicted to do so by the model, $10/10 + 2 + 8 = .50$). Similarly, those who preferred to seek formal treatment were accurately predicted by the model 47.1% of the time. Finally, those who preferred not to seek any help, were predicted by the model 79.5% of the time (best prediction).

In addition, a bi-nominal logistic regression was performed to predict the effects of levels of cannabis use, social support, barriers to treatment-seeking and perceived harm (independent variables) on the likelihood that participants have sought treatment for their cannabis use in the past. The dependent variable, which was whether they have sought treatment or not, was coded as 1 and 2 for answers yes and no respectively. A test of the full model as compared to the intercept model was significant, meaning that full model with all predictors was a significant improvement

in fit over the null model $X^2(4, N = 77) = 15.8, p = .003$. The model explained 26.4% (Nagelkerke R^2) of the variance in treatment decisions. The model correctly classified 94.4% of those who did not seek treatment and 8% of those who sought treatment, with the overall accuracy of 76.6% in the sample. In other words, results showed that 76.6% of the sample was correctly predicted by the model to fall into their respective groups.

Using .05 criteria for statistical significance, findings showed perceived harm was the only variable which was significantly associated with treatment decisions made in the past. Higher scores in perceived harm increased the likelihood of seeking treatment ($b = .108, s.e. = .047, p = .022$). The odds ratio of 1.114 indicated that the odds of seeking treatment among individuals with higher harm perception was 1.114 times as large as the odds of seeking treatment for individuals with lower harm perception.

Levels of perceived harm and future treatment decisions

Prior to conducting a one-way analysis of variance (ANOVA) between treatment-seeking decisions (independent variable) and perceived harm (dependent variable), assumptions of conducting this analysis were tested. The assumptions of normality were checked and found to be satisfied as all three groups were distributed with skew and kurtosis value less than $|2.0|$ and $|9.0|$ respectively. However, the *Levene's F* test found that the homogeneity of variance assumption was violated ($p = .001$). Therefore, the *Welch's F* test was used. It was significant at the .05 α level ($p < .001$): *Welch's F*(2, 42.86) = 14.7, $p < .001$.

A one-way ANOVA test was then conducted to examine whether people who wanted to seek informal treatment/formal treatment/no treatment, differed with respect to their perception of harm concerning cannabis. The test revealed a statistically significant result: *Welch's F*(2, 42.86) = 14.7,

$p = .00$, confirming that not all treatment decisions had the same average score on perceived harm. The estimated omega squared ($\omega^2 = .26$) indicated that approximately 26% of the total variation in average score on individuals' perception of harm is attributed to their treatment-related decisions. As displayed in Table 5 the “not seek any help” group had the lowest mean value of perceived harm ($M = 15.46$, $S.D. = 8.48$), whereas “seek formal help” had the highest mean value of perceived harm ($M = 25.29$, $S.D. = 5.49$).

Table 5. Mean, standard deviation and count values of perceived harm in treatment-decisions

Perceived harm of cannabis use	N	Mean	Std. Deviation
Seek Informal Help	20	23.25	5.359
Seek formal Help	17	25.29	5.497
Not seek any help	39	15.46	8.482
Total	76	19.71	8.365

Post hoc comparisons were made using the *Games-Howell post hoc* test to determine which pairs of the three treatment related decisions differed significantly on the measure of perceived harm. These results indicated that individuals who chose “seek formal help” ($M = 25.29$, $S.D. = 5.49$) and “seek informal help” ($M = 23.25$, $S.D. = 5.35$) had a significantly higher average score on perceived harm as compared to those who chose “not seek any help” ($M = 15.46$, $S.D. = 8.48$). In other words, individuals who scored higher in perceived harm were more likely to seek formal help or informal help than no help. The effect sizes for these two significant effects were 1.37 and 1.09 respectively.

Perceived Harm and Level of Cannabis Use

To assess if individuals with different levels of cannabis use differed with respect to their perceived harm of cannabis, a one-way ANOVA analysis was conducted. Prior to analysis, the assumptions of normality were checked and found to be met. Data distributed in all three levels of cannabis use had skew and kurtosis value less than |2.0| and |9.0|. *Levene's test* of homogeneity of variances test for this data set was significant which indicated that the assumption of homogeneity of variance was not met. Therefore, the *Welch's adjusted F ratio* was used instead. The *Welch's F* test was significant at the .05 α level: *Welsh's* $F(2, 46.184) = 6.555, p = .003$.

Table 6 provides the descriptive data containing the means and standard deviations of perceived harm scores by each level of cannabis use. The PCUD group had the highest mean values of perceived harm ($M = 23.55, S.D. = 7.380$), whereas the low harm cannabis use had the lowest mean values of perceived harm ($M = 15.04, S.D. = 9.315$).

Table 6. Mean, standard deviation and count values of perceived harm in cannabis use

Perceived Harm	<i>N</i>	Mean	Std. Deviation
Low harm cannabis use	23	15.04	9.315
Hazardous cannabis use	24	19.54	6.199
PCUD	29	23.55	7.380
Total	76	19.71	8.365

The one-way ANOVA test showed a statistically significant result which revealed that individuals with different levels of cannabis use differed in perceived harm: *Welsh's* $F(2, 46.184) = 6.555, p = .001$. The estimated omega squared ($\omega^2 = .033$) indicated that only a small percentage

(approximately 3%) of the total variation in average score of individuals' perceptions of harm is due to their scores on the CUDIT-R scale.

Post hoc comparisons were made using the *Games-Howell post hoc test* to analyse which pairs of the three levels of cannabis use had a significant difference in perceived harm. Tests revealed that only one pair had a significant difference in their harm perception of cannabis. The results showed that individuals with PCUD ($M = 23.55$, $S.D. = 7.380$) had a significantly higher ($p = .003$) average score on perceived harm compared to those with low harm group ($M = 15.04$, $S.D. = 9.315$). With Cohen's d the effect size was calculated as 2.94.

Relationship between levels of cannabis use and future treatment decisions

A Chi Square test of independence was performed to analyse the relationship between levels of cannabis use and the treatment making decisions. Results showed that there was a significant relationship between the level of cannabis use and decision to seek treatment in future $\chi^2 = (4, N = 76) = 13.58, p = .009$.

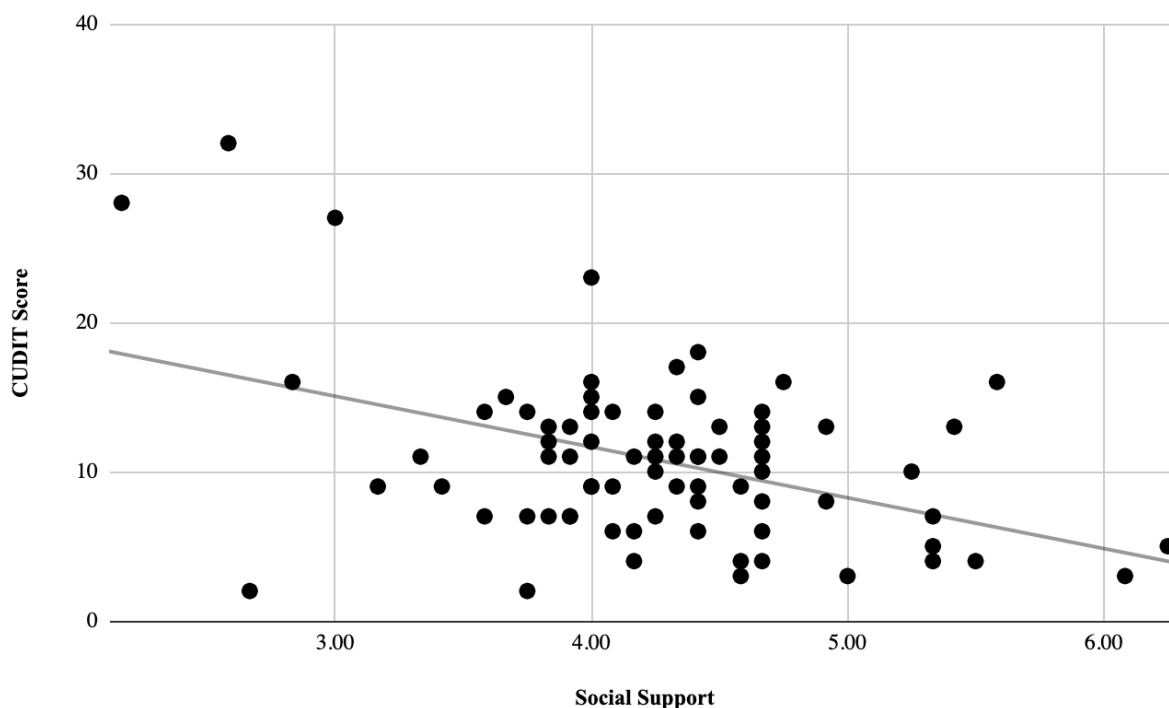
Individuals with low harm cannabis use (82.6%) were less likely to seek help compared to those with hazardous use (41.7%) and PCUD (34.5%). Whereas individuals with PCUD (31.0%) were less likely to not seek formal help compared to those with hazardous use (29.2%) and low harm use (4.3%). Similarly, individuals with PCUD (34.5%) were also less likely to not seek informal help compared to those with hazardous use (29.2%) and low harm use (13.0%). Note that percentages in the bracket show - for each cannabis use level separately - the percentages of participants who fall into each treatment decision category (formal, informal and no help).

The measure of association between levels of cannabis use and treatment related decisions was determined by *Cramer's V*. The effect size was found to be large with *Cramer's V* = .29.

Relationship between perceived social support and CUDIT-R score

To conduct a *Pearson Correlation* analysis, social support and level of cannabis use variables were checked for the required assumptions using the simple scatter plot and box plot tests. The data did not meet the assumptions of linearity.

Figure 3. Simple scatter of CUDIT-R score by Social Support



Note. *CUDIT-R score* = *Cannabis Use Disorder Identification Test Revised score*; *Social Support* = *MSPSS score*

There were 5 significant outliers found to be distorting the results. An attempt was made to transform data using *log transformation* method in SPSS statistics; however, it could not solve this

issue. Considering the discrepancy in opinions related to cannabis, the target population, and the research questions, the data was considered a natural variation of the population and therefore, was removed.

A *Pearson Correlation* inspected the association between perceived social support ($M = 4.28$, $S.D. = .56$) and level of cannabis use ($M = 10.53$, $S.D. = 4.54$). The relationship between the variables was found to be negative, moderate in strength and statistically significant, $r = -.284$, $n = 72$, $p = .01$. Overall, the results showed that increases in perceived social support correlated with the decreases in levels of cannabis use or in other words, higher levels of cannabis use (PCUD) were associated with lower perception of social support and vice-versa.

Discussion

The findings of this study extend existing knowledge about treatment-barriers among individuals who use cannabis regularly in the UK. Participants who responded to the survey were aged 29 years, took cannabis 2 to 4 times a month and scored moderately on both CUDIT-R and SDS. On average participants had moderate scores on perception of harm and social support. Seventy percent of the sample responded that they never sought any help, 15.5% sought informal help and 14.2% sought formal help for cannabis use in the past. Nearly half of the sample responded that they would not seek any help, 25% would consider informal help and 22% would consider formal help in the future for cannabis use. Level of cannabis use; perceived harm; social support; and barriers to treatment variables were tested to examine the individual contribution of each variable to predict treatment-seeking decisions in the past and future. Individuals who scored higher in perceived harm were more likely to have sought treatment in the past. Similarly, those who scored higher in perceived harm were more likely to seek formal treatment in the future. Those with higher

perceived harm were also associated with PCUD. In contrast, individuals who scored higher in perceived social support were less likely to seek formal treatment in the future and were associated with low harm cannabis use.

The current study used the framework of the HBM to understand constituents of treatment-seeking decisions. Key constructs from the HBM model (such as perceived harm) were crucial in predicting treatment-seeking decisions. However, the perceived social support variable, which was not the part of HBM (as HBM does not consider environmental influences), also provided important information about participants' treatment-seeking decisions. In the present study, individuals with higher perceived social support indicated low harm cannabis use and were less likely to consider formal treatment. This finding is consistent with Pol et al., (2013) study. Authors concluded that individuals with cannabis dependence who do not seek formal treatment tend to have higher perceived social support and less dependence on cannabis, therefore, preference for informal help for this group should be considered.

Furthermore, findings from the present study emphasise the importance of considering characteristics of individuals experiencing different levels of cannabis-related harm in attempts to examine the determinants of treatment-seeking behaviour. In this study, individuals with low harm cannabis use (CUDIT-R score 0-7) reported less need to enter formal treatment in the future compared to people with PCUD. One explanation of this finding may be that participants who are currently taking cannabis in a less harmful manner, are not experiencing the adverse consequences of taking cannabis, therefore, would not currently consider formal treatment. However, further long-term follow-up data is required to assess the longevity and nature of these findings. Moreover, another reason for less preference to seek formal treatment in this group could be due to the belief that one has the ability to successfully implement a behavioural change to achieve desired

outcomes, also known as self-efficacy. Unlike other illegal substances, self-efficacy is reported highest among individuals with cannabis-related problems and self-efficacy has also been the strongest predictor of reducing cannabis use (Kadden & Litt, 2011). In CUD treatment self-efficacy is promoted by teaching coping skills in various interventions such as CM (Contingency Management), which in turn, reduces the level of cannabis use post-treatment.

Consistently, previous studies have highlighted a growing need for low-threshold informal support which promotes self-reliance, for those with less dependence and experiencing lower levels of harm (Pol et al., 2013). While informal types of treatment may increase treatment participation for individuals with lower levels of cannabis use, health care provisions (from a clinical standpoint) are generally tailored around the level of harm a particular drug engenders (Nutt et al., 2010). In the case of cannabis, Nutt et al., (2007) in their extensive study, showed that cannabis-related harm ranked higher for risk of dependence and causing problems in the user's family than physical harm. These findings were in line with the current study, most highly ranked items in relation to cannabis harm were mental health concerns, addiction, and family problems. Lowest ranked were physical problems such as risk of overdose and death by overdose. Thus, cannabis treatment should be integrated with examination of individuals feelings about whether cannabis use is affecting their mental health as this may encourage them to remain in the treatment and recover.

In light of the swiftly shifting political and cultural image of cannabis (Godlee, 2019), it was pertinent to measure individuals' opinion on the harmfulness of cannabis, and how it could affect their views on treatment. Although cannabis use and legalisation remains the subject of heated debate in the UK, the link between cannabis use and risk to mental health seems to have been a commonly co-occurring concern among individuals who use cannabis regularly (Koskinen et al., 2010). In the present study, majority of participants indicated that "risk to mental health" item in

the survey reflected the harm caused by cannabis. Consistently, a previous survey on general perception of cannabis related harm among British students found that participants perceived cannabis as less harmful than some legal substances (such as alcohol), however, they rated cannabis as the most harmful drug for mental health issues (Pedersen et al., 2016). One reason for this association could be due to the acute effects of cannabis experienced by individuals which is highly associated with triggering anxiety, depression, depersonalisation (change in subjective reality characterised by feeling as if one is an outside observer of themselves and everything surrounding them) and in some cases psychosis (Volkow et al., 2014). For example, depersonalisation (which is rooted in anxiety) can occur at the first use of cannabis, during use and in some cases several days after use. Individuals experiencing depersonalisation differs from those with psychosis disorders in a way that they are aware of the intact reality despite the dissociative disturbance (Madden & Einhorn, 2018). Another reason why individuals using cannabis see it being harmful to mental health could be due to the overlap between their cannabis use and mental health issues. For example, several individuals who use cannabis regularly do so as a coping mechanism to handle mental health issues while others start experiencing mental health issues after initiating cannabis use (Rey & Tennant, 2002).

Higher perception of social support, in the present study, had a negative relationship with treatment-seeking. When it comes to substance use in general, it is crucial to understand the social facilitators of consumption behaviour, since in most cases the initiation of use occurs at an early age as a social activity (Strickland & Smith, 2014). There is an extensive body of literature focused on peer influence in shaping and promoting cannabis-related behaviour (K. H. Beck et al., 2009). The paradoxical relationship between perceived social support and cannabis use could be explained by *Social Identity Theory* (Ellemers & Haslam, 2012), suggesting that a person's self-

image is deeply rooted in the membership of a social group (Dingle et al., 2015). In this study, cannabis users with high social support were less likely to seek formal treatment, could be due to the reason that they strongly identified with cannabis subculture groups and thus neither saw the need for treatment nor wanting to quit. Similarly, as with other illegal substances, cannabis subculture is characterised by association with other cannabis users and estrangement from the conventional society (Moshier et al., 2012). In the present study, individuals with lower social support had higher levels of cannabis use, which may be indicative of social isolation and stigmatisation individuals experience because of violating normative behaviour. This notion is supported by Gates et al., (2012), concluding that dependent cannabis users in a typical social setting are more reluctant to enter treatment and highly sensitive to the stigma attached with seeking treatment: “The most frequently reported social barrier to treatment entry is the stigma associated with being labelled as an illicit drug user and associated concerns over privacy” (Gates et al., 2012 para. 6). Additionally, individuals with higher perceptions of social support may have fewer interpersonal conflicts (Pettersen et al., 2019). Individuals with adequate and supportive interpersonal relationships may not seek treatment as their relationships provide sources of support to cope with stress, engage in healthy behaviour and increase their well-being. For example, religious beliefs and group associations have shown to be linked with lower levels of cannabis use and higher rates of abstinence during treatment (Burdette et al., 2018; Chitwood et al., 2008; Grim & Grim, 2019).

Furthermore, the most commonly reported barrier in the study was not having confidence in treatment services. While there are numerous factors which could potentially cause disbelief in treatment services, the most commonly reported reasons in previous studies were confidentiality concerns; lack of alternative treatment options (for example, delivered via computer); need for

cannabis-specific treatments; and easy accessibility to treatment services (Pol et al., 2013). These barriers were prevalent among non-treatment seeking individuals with regular cannabis based in the community. Additionally, in the present study, participants with different levels of cannabis use did not differ in perceived barriers to treatment scores. However, the majority of participants in the PCUD group (with a higher chance of cannabis dependence) reported that they never sought formal treatment in the past. Nonetheless, majority of those who have had the experience of formal treatment in the past indicated the preference to seek formal treatment in future. This finding is in line with der Pol et al., (2013) study which concluded that individuals with cannabis dependence in the community, who never sought treatment, have negative attitudes towards treatment as compared to individuals with cannabis dependence in clinical settings.

Limitations

There are several limitations to the current study. First, a convenience sample of individuals who self-reported using cannabis in the last three months was recruited, therefore, the study results cannot be generalised to the entire UK population with cannabis problems. Second, regional data was not collected, therefore, it cannot be determined the extent to which findings from the study represent all of the UK. These limitations are due to the fact that gaining access to a broader cannabis population in the UK is a lengthy and costly process. Probabilistic sampling techniques (for example, simple random sampling) are better for creating a sample that is representative of the population. The sample size of the current study was below G-Power sample size estimations, which means that the study was underpowered. The study could not recruit many participants, which could have potentially yielded stronger results. This could potentially be due to the illegal status of cannabis in the UK, which was also indicated from the fact that several respondents did not reveal their gender identity. Another reason could be due to the restrictions in place on social

media platforms (e.g., Facebook) to advertise anything related to illegal substances which also includes advertising for research purposes. In our case, this was especially prevalent, as the word “cannabis” had been *flagged* several times, resulting in having to request a manual review from the *Ads Support team*. In terms of recruitment strategy, advertisement through Twitter and Reddit allowed wider response from participants than Facebook. Also, the study is restricted to the age group and country, which limited the exploration of prevalence of cannabis use and treatment-seeking attitudes amongst other age groups and could not be generalised to different geographical contexts.

Additionally, there are several ways of consuming cannabis, which could potentially have different measures and outputs. Also, there are limitations in measuring objective indicators of recent cannabis use and dependence (explained further in page 133). The study survey did not contain specific questions on the mode of cannabis use (joints or pipes) or type of cannabis use (skunk, hash, weed etc), it rather focused on the broad level of use obtained from the CUDIT-R. Furthermore, the present study is exclusive of cannabis-related problems and barriers to cannabis treatment-seeking. It does not account for comorbidity and polydrug use (these variables were not measured). Lastly, although demographic details of gender in relation to cannabis use and other variables were provided, the current study did not explore gender differences in terms of cannabis use and treatment-seeking. This was due to lack of sufficient power for subgroup gender analyses.

Conclusions

In the current study, level of cannabis use, perception of harm and perceived social support were crucial factors in predicting treatment-seeking decisions amongst regular cannabis users in the UK. Lack of confidence in treatment services was the most frequently reported barrier to treatment-

seeking. Considering the diverse pattern of cannabis use (for example, low harm or moderate harm use); tentatively it could be important to promote self-reliance through treatment (for example, brief motivational talk with the GP) or provide the option for informal treatment (SMART recovery). Moreover, to increase cannabis treatment uptake, service providers should focus on delivering easily accessible, person-centred treatments delivered in various settings and tailored to individuals' subjective requirements especially concerning their opinions on harms caused by cannabis. Lastly, in the context of the growing need for moderation in use rather than abstinence as the treatment goal, future studies need to identify what constitutes low harm use and if moderate use of cannabis could be considered as an appropriate treatment goal. Findings from the current study raise several questions about the attributes of existing treatments for cannabis. Individuals negative views about treatment in relation to treatment-seeking barriers warrants further investigation about the characteristics of psychotherapeutic treatments which is primarily used for cannabis problems.

Chapter 3

The effectiveness of psychotherapeutic interventions for cannabis use - a mapping review and meta-analysis

Abstract

Background

Cannabis use and its related harms are increasing in prevalence, adding to the public health burden. Disproportionately few individuals seek formal treatment, and widely accepted psychotherapeutic treatments for cannabis show modest effect. Clinical trials evaluating the effectiveness of psychotherapeutic treatments show mixed results while focusing primarily on outcomes such as abstinence, frequency of cannabis use and self-efficacy.

Aims

To: (a) map out the trend in the publication of RCTs in psychotherapeutic treatment of cannabis (b) identify and characterise the method of reporting abstinence in cannabis treatment RCTs (c) summarise approaches for measuring and reporting frequency of cannabis use (d) highlight the approaches of other outcome domains such as self-efficacy which could potentially add a complimentary mechanism to the treatment and influence the treatment goal (e) pool results from studies reporting frequency of cannabis use outcome for a meta-analysis

Methods

Publications from 1997-2019 were extracted from the following databases: *Medline*, *Embase*, *PsycINFO*, *Web of Science* and *BIOSIS*. An initial scoping search resulted in 985 studies.

Results

A further 19 studies were selected after the main search. Most studies (78.9%) had Cognitive Behavioural Therapy (CBT) in treatment and Delayed Treatment Control (DTC) in control

condition (26.3%). Meta-analysis results showed the superiority of treatment groups over Delayed Treatment Control groups. TLFB interview was the most commonly used method for both frequency of cannabis use and abstinence outcomes. Seventy-three percent of studies measured the frequency of cannabis use. Of the studies reporting abstinence, 58.3% calculated continuous abstinence during treatment, 41.6% reported point-prevalence abstinence, and 16.6% measured repeated point-prevalence abstinence. Thirty-six percent of studies reported self-efficacy outcomes. In total, 21% studies reported an effect size for cannabis-use frequency, 36.8% for proportion of participants reported abstinence, 10.5% for mean days of abstinence and, 21% for self-efficacy measures.

Conclusion

Evidence-based psychotherapeutic treatments for cannabis show promising results in reducing frequency of cannabis use through CBT, MET and CM approaches, however, standardisation in measuring clinically significant outcomes requires substantial and immediate consideration.

Introduction

As discussed in Chapter 1, cannabis remains the most commonly used illegal substance in the UK with concerning statistics of harmful use and dependence. Cannabis is also by far the most widely used, supplied and misused illegal substance in the world with prevalence rates of about 2.5% of the world population using cannabis annually as compared to 0.4% using other illegal drugs such as cocaine and opiates (WHO, 2021). The growing public health burden of cannabis-related problems worldwide has led to the emergence of studies highlighting the adverse consequences of cannabis resulting from both acute and chronic use, including the risk of CUD (Karila et al., 2014; Volkow et al., 2014). Although effective evidence-based treatments for CUD are available, there exists a threefold problem: treatment-seeking rate for those who might benefit from treatments is low; treatment-seeking barriers are indicated by having negative views about treatment; and clinical effectiveness of existing treatment shows mixed results (Budney et al., 2007b). Additionally, pharmacotherapeutic treatment in reducing cannabis use lacks robust evidence (however cannabidiol is being studied as a potential pharmacological treatment option for CUD) (Bahji et al., 2021). In the context of these findings, there exists an urgent need to examine the characteristics of psychotherapeutic treatments for cannabis to understand what constitutes an effective support intervention and how do clinical trials improve patients care.

Cannabis treatment trials typically include individuals meeting the diagnostic criteria for cannabis dependence or CUD at baseline. *The Diagnostic and Statistical Manual of Mental Disorders, Third Edition*; DSM-III (Pichot, 1986) first described the pathological criteria for the diagnosis of cannabis dependence with additional information regarding the lack of data concerning the physiological symptoms (for example, tolerance or withdrawal criteria of cannabis dependence could not be used to distinguish between harmful use and non-harmful use) among cannabis users.

The Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised; DSM-III-R (Kendell, 1988) further acknowledged cannabis dependence on the basis of both physiological and behavioural symptoms, however, cannabis abuse was considered as a subcategory for individuals who did not meet the dependence criteria, but took cannabis despite the negative physical, social, occupational, psychological outcomes or risk-related situations. To further extend, *The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; DSM-IV (C. C. Bell, 1994) (which had the same dependence criteria as DSM-III-R) classified cannabis dependence and abuse as two separate diagnostic criteria, and required 3 out of 6 criteria to be met for cannabis dependence, and 1 of the 4 criteria for cannabis abuse. However, after the publication of DSM-IV, some studies identified several withdrawal symptoms prevalent among individuals with a long history of heavy cannabis use. These crucial findings were taken into consideration and addressed in DSM-V (American Psychiatric Association, 2013), which included Cannabis Withdrawal Syndrome (CWS) to complete the diagnostic criteria for *CUD* (characteristics of DSM-V are provided in Chapter 1).

Psychotherapeutic techniques are the mainstay of treatment for helping individuals with cannabis problems. A detailed description of psychotherapeutic treatments available for CUD, with various success rates, is provided in Chapter 1 (pages 25-31). However, it is crucial to understand the core principles on which these widely adapted treatments are based and how these principles lie at the heart of different schools of thought in Psychology. *Psychotherapeutic treatments*, also known as *talking therapy*, is an umbrella term which includes a range of treatment methods to target several aspects of psychological problems including cognitive, behavioural and interpersonal (American Psychological Association, 2019). The main approaches of psychotherapy fall under four main categories. *Psychodynamic therapy* aims to discover the unconscious motivations associated with

the problematic thought process and behaviour (for example, *Supportive-Expressive Therapy*). Psychodynamic approach assumes that human behaviour is “deterministic” and influenced by biological drives. This approach is highly focused on the internal unconscious drives which could only be analysed by the process of psychoanalysis (Short & Thomas, 2014). *Behaviour Therapy* focuses on the association between stimuli and response (for example, CM treatments). It is concerned with observable learned behaviours and how those behaviours are affected by the individual's environment. Therefore this approach heavily focuses on the importance of nurture: “Humans are born as a tabula rasa or blank slate on which experience writes the patterns of their future behaviour” (Short & Thomas, 2014, p. 202).

The *cognitive approach* was formulated as a response to the failure of other approaches in considering the cognitive aspects of the mind. Like the analogy of information processing in computers, the cognitive approach uses an “information-processing” technique in which “humans are active information processors”. Cognitive therapies aim to amend the individual’s thought process rather than the behaviour (for example, CBT) (Leahy, 2017). *Humanistic approach* focuses on enhancing the individual’s own capacity to change by providing encouraging feedback (for example, MI treatments). In the humanistic approach, the practitioner provides a safe environment for the patient to redeem control over their life. This approach is concerned with the subjective human experience rather than formulated scientific queries (Short & Thomas, 2014).

In a broad context, psychotherapy focuses on minimising the issue by altering problematic thought processes and providing useful coping strategies. Psychotherapy can be conducted through a variety of programs depending on the individual's specific needs. The time duration of the interventions also depends on a person's specific goals. It can be short-term, consisting of a few sessions, targeting the immediate problem or can be administered over several months focusing on

the more complex issues (Short & Thomas, 2014). In addition, psychotherapeutic interventions are delivered in various settings (pages 25-31) and through different mediums. Computer-based interventions are becoming increasingly popular for those with lower levels of substance dependence (Moore et al., 2011). Computer-based interventions have several benefits such as less face-to-face interaction, mass communication, flexibility of use, easy accessibility, wider reach and interactive interpersonal communication (Moore et al., 2011). There are a number of ways through which psychotherapeutic treatments can be delivered by computer or web. These include psychotherapy via interactive computer interface (uses patients input to make psychotherapy decisions) which can be delivered by stand-alone computers, on a mobile device or via telephone and psychotherapy delivered by human therapist via internet through real time (also known as e-therapy) (Kaltenthaler & Cavanagh, 2010). For cannabis problems, computer-based CBT programs are the most available treatment option (Budney et al., 2015).

While effectiveness of psychotherapeutic treatments for CUD (such as CBT) have been widely studied, in a much larger population than pharmacological interventions, there appears to be an inconsistency in the measurement of primary outcomes (Lee et al., 2019). There have been two systematic reviews assessing evidence pertaining to the effectiveness of psychotherapeutic treatment for cannabis use. Interestingly, both reviews highlighted the lack of standardisation on assessing optimal treatment outcomes across cannabis treatment trials (Lee et al., 2019; Peters et al., 2011). Reviews also shed light on the variations in selection of outcome domains as the primary outcome across cannabis treatment trials. However, the most commonly measured outcome domains were abstinence and frequency of cannabis use. Abstinence in general refers to a time during which individuals with a SUD refrain from a relapse. A relapse is defined as the point at which individuals return to using drugs regularly after being abstinent for a period of time (Hughes

et al., 2003). Abstinence in substance use literature serves a crucial purpose in determining the clinical significance of the treatment: “a major goal of the abstinence measure is to quantify the treatment effect size accurately, i.e., the magnitude of the difference between active and control conditions” (Hughes et al., 2003 para. 7).

A typical measure of abstinence in cannabis psychotherapeutic treatment trials (Stephens et al., 2002) include three types of abstinence: *continuous abstinence*, *point-prevalence abstinence* and *repeated point-prevalence abstinence* (Budney et al., 2006). Continuous abstinence is defined as the abstinence between the day individuals stop using cannabis (“quit day”), to the follow-up point. In cannabis treatment, continuous abstinence is the most popular measure and is typically assessed from the beginning to the end of the treatment, often referred as “continuous abstinence during the treatment” (Budney et al., 2006, p. 28). Several researchers consider continuous abstinence to be the gold standard method to measure abstinence over time as it requires a longer period of time and therefore has more potential of predicting a long-term abstinence (Hughes et al., 2003). In addition, since continuous abstinence begins from the quit day, it is closely associated with the intent to treat approach.

Point-prevalence abstinence is another commonly used abstinence measure in cannabis treatment, it is referred as the abstinence during a certain time window preceding the follow-up (Hughes et al., 2003). In clinical trials concerning cannabis treatment, point prevalence abstinence is typically measured in 90 days prior to the follow-up point (Marijuana Treatment Project Research Group, 2004). Finally, repeated point-prevalence abstinence simply refers to the point prevalence abstinence at various follow-up points (Hughes et al., 2003). Most cannabis treatment trials utilise self-report *Timeline Follow Back* (TLFB) (Robinson et al., 2014) and urinalysis methods; to verify abstinence during the follow-up period (Budney et al., 2006; Marijuana Treatment Project

Research Group, 2004). TLFB is a calendar-based method, typically administered by an interviewer who prompts participants to give an estimate of days they remember using cannabis and a brief summary of the quantity of cannabis they typically used in a day (for example, joints per day). This information is further examined by independent collateral verifications (Robinson et al., 2014).

Besides abstinence, frequency and quantity of cannabis use are other prominent outcome measures across CUD treatment trials. From the point of clinical significance, both cannabis frequency and quantity outcomes serve an important role as these outcomes are independently associated with the effects of cannabis and related problems (Lee et al., 2019). However, the heterogeneity in the measurement of these domains creates challenges in establishing a clear conclusion regarding problematic cannabis use (Lee et al., 2019; Peters et al., 2011). The measure of frequency of cannabis use varies across trials with regards to the number of days it is calculated. However, the difference in the mean days of use in 90 days pre and post treatment point is the most common method of assessing reduction in use (Budney et al., 2015; Walker et al., 2015). Similarly, other methods include 30 days and 28 days pre/post difference in the mean days of cannabis use. In addition, measures of quantity also vary across cannabis trials, however, the number of joints smoked per day is the most common method (Lee et al., 2019). TLFB and collateral verification methods are typically used to measure the frequency and quantity of cannabis use (Marijuana Treatment Project Research Group, 2004; Stephens et al., 2002).

To a large extent overcoming problematic behaviour (such as CUD) is related to the extent of individuals' beliefs that they are capable of taking necessary steps in order to exercise restraint: "if we do not think we can do something, we do not try or if we do try we give up easily" (West & Brown, 2013, p. 46). This concept is defined as self-efficacy and it plays an important role in

changing behaviour (West & Brown, 2013). Self-efficacy in this context is defined as the confidence in oneself to restrain from using cannabis (Walker et al., 2015). In relation to CUD, self-efficacy is an important “patient-centred outcome measure”, which means treatment outcomes that are valuable and relevant to the patient (Gullo et al., 2021). Self-efficacy also plays an important role in determining treatment-seeking decisions, those with higher self-efficacy prefer to manage their cannabis use without professional help (page 79). Several researchers advocated that the most effective treatments for cannabis such as CBT, MET and CM teach individuals to adapt coping skills to deal with high risk situations; and increased coping skills leads to higher-self efficacy (Litt et al., 2013; Stephens et al., 1993). In turn, higher self-efficacy, which is associated with successful coping skills, leads to long-term abstinence. Cannabis treatment trials measure self-efficacy for avoiding cannabis at baseline and follow-up. Change in self-efficacy pre- to post-treatment has been shown to be associated with greater abstinence over time (Litt et al., 2008). The Marijuana Self-Efficacy Scale is the most common scale of measuring individuals’ confidence in not using cannabis in 20 high-risk situations (Stephens et al., 1995).

Finally, to predict clinically-significant outcomes, clearly and with accuracy, it is important to make a distinction between the type of control groups used in cannabis treatment trials: “Different control conditions imply different effect estimates, and recognizing this is crucial for drawing accurate conclusions concerning treatment efficacy” (Karlsson & Bergmark, 2015 para. 2). A key purpose of having a control group is to evaluate the differences in participant outcomes resulted by *study treatment* from outcomes resulted by factors such as participant expectations or other treatment (Karlsson & Bergmark, 2015). Evidently, in clinical trial design there are two types of control conditions: *inactive* (for example, no treatment, delayed treatment or waiting list) and *active control* (for example, previous used standard treatment or a different treatment) (Budney et

al., 2015; Copeland et al., 2001b). The distinction between these two is that the inactive control provides “absolute-effect estimates” whereas active control gives “relative-effect estimates”. Absolute effect refers to the estimate of the treatment effect in studies which compare treatment group to a non-treatment control group and establish whether individuals benefited out of the study’s intervention as compared to no intervention. Conversely, relative effect determines the relative effect of a treatment as compared to a different or standard treatment (Karlsson & Bergmark, 2015).

Although both absolute and relative effects estimates may be somewhat circumstantial (for example, delivery style of therapy may differ in trials), they provide two different casual contrasts in cannabis trials, therefore, providing clear distinction between these effects, is the crucial part of determining effectiveness (Karlsson & Bergmark, 2015). In addition, as stated in Chapter 1 (page 37) several studies on cannabis treatment in the past have focused on “natural recovery” during the study. Natural recovery implies that patients in the control group showed a significant decrease in cannabis use without being provided treatment (Rebgetz et al., 2015). A systematic review on reduction of cannabis use in inactive control groups across cannabis treatment trials (trials with any kind of cannabis treatment), showed an average reduction of 0.442 standard deviation in control groups (Rebgetz et al., 2015). Therefore, in this case, studies with inactive control groups have the advantage to highlight: (a) changes in cannabis use for those who were not given any treatment, (b) if these changes are clinically meaningful.

To conclude, with the increased disparity between cannabis-related problems and treatment-seeking rates, there appears to be a gap between clinical trials showing effectiveness of treatment and reports of negative views about treatment among cannabis users. This issue is compounded by the fact that previous studies have shown heterogeneity in the measurement of treatment outcome

domains which limits the generalisability of results. Thus, it is imperative that more studies evaluate the effectiveness of existing psychotherapeutic interventions in an attempt to increase treatment-seeking rates and reduce treatment system barriers. Cannabis treatment trials should ultimately improve patient care and evaluate outcomes that reflect patients' goals from the treatment and their concerns. The current mapping review aimed to provide an extensive overview of characteristics of cannabis treatment trials with a focus on highlighting the measurement and reporting of treatment outcomes and effectiveness of treatment in reducing the frequency of cannabis use.

Aims and objectives

The current review is a *mapping review*, also known as *evidence map* (Miake-Lye et al., 2016). Although a mapping review is the newest approach to evidence synthesis, and yet to undergo various developmental scrutiny to be standardised for evidence synthesis; it primarily aims to map out the existing evidence in the literature (Miake-Lye et al., 2016). A previous systematic review about what constitutes a mapping review concluded that there is a significant heterogeneity in how studies in general justify the definition of a mapping review and employ its methodology. However, in the majority of cases mapping reviews are defined “as a systematic search of a broad field to identify gaps in knowledge and/or future research needs that presents results in a user-friendly format, often a visual figure or graph, or a searchable database” (Miake-Lye et al., 2016 para. 4).

After reviewing literature on treatment-seeking barriers in Chapter 1 and 2, mapping review approach appeared to be the best fit to answer further questions. Previous cannabis-treatment trials have agreed and disagreed on optimal treatment and outcome measures. Studies exhibited

effectiveness of a range of psychotherapeutic interventions, however, the quality of evidence for primary outcome, such abstinence, was low. The end-users of this evidence (for example, patients, their family, policy makers and clinicians) depend on the expert opinions of researchers to select and report the outcomes which is of importance to patients in real-world clinical settings.

Due to heterogeneous evidences in cannabis treatment trials along with treatment system barriers being reported as reasons to not seek treatment, the current review will conduct a broad search of the evidence base pertaining to: selection, measurement and reporting of primary treatment outcomes and effectiveness of psychotherapeutic treatments in reducing cannabis use. The review aimed to provide an extensive overview of evidence related to the broad field of psychotherapeutic treatments for cannabis-related problems as “psychotherapeutic interventions remain the frontline responses” to provide support for cannabis problems (Burkinshaw, 2017). Since the review concerns the effectiveness of psychotherapeutic treatments, it focused on most commonly selected cannabis treatment outcome domains (abstinence, frequency of cannabis use and self-efficacy) and respective measures. The review addresses the following questions:

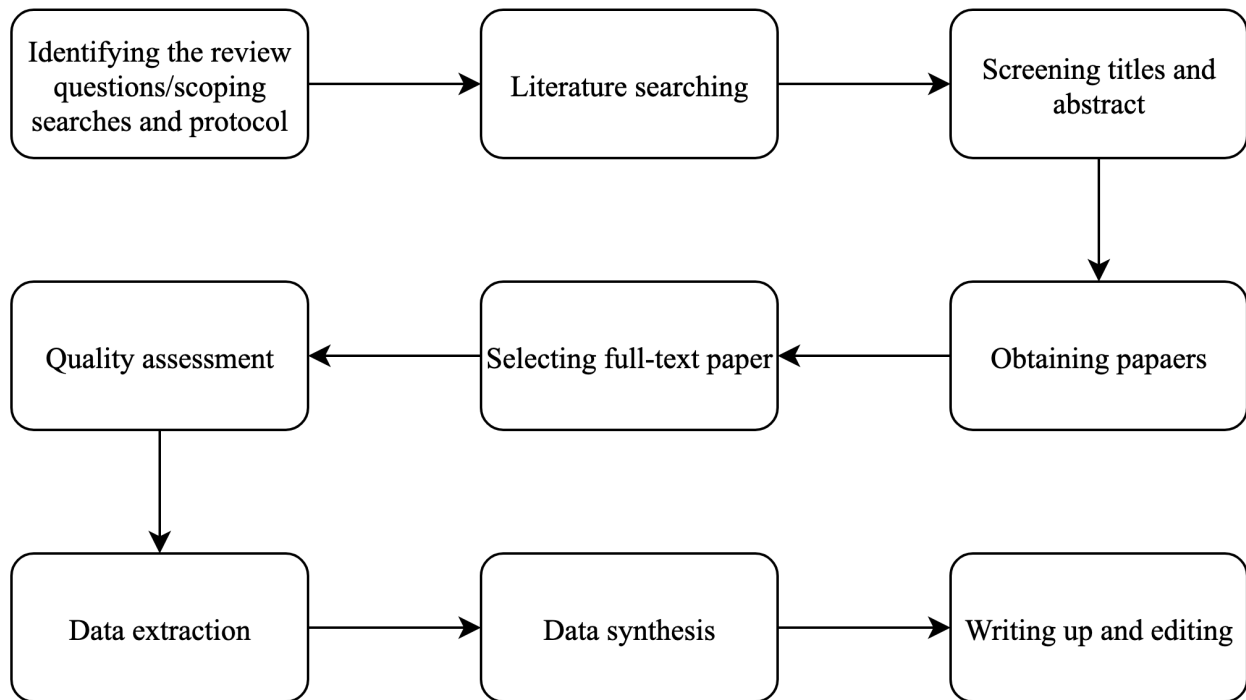
1. How is abstinence from cannabis measured and reported as the key end-of-treatment outcome?
2. How is the frequency of cannabis use measured and reported for pre- and post-treatment points?
3. How is the magnitude of treatment effect measured (relative effect or absolute effect) and what are the between-group effect sizes associated with the treatment group and control group?
4. How many studies examined the role of self-efficacy as a mechanism of behaviour change?
To what level did self-efficacy predict long-term abstinence?

5. Are psychotherapeutic treatments more effective than delayed treatment condition for reducing the frequency of cannabis use?

Methods and design

The whole process of refining research objectives, mapping out evidence, and reporting the results went through nine individual stages (Boland et al., 2017). At the initial stage, a broad question related to the effective treatment options for cannabis-related problems was developed. The result highlighted all treatment options including the pharmacotherapy treatments. After finding a vast body of literature on this topic, the review question was narrowed down, including only psychotherapeutic treatments. The summary of the nine stages through which mapping review was planned and executed is summarised in Figure 3.

Figure 4. Key steps taken in mapping review (Boland et al., 2017)



Inclusion/exclusion criteria

Expert consensus surrounding evidence review clearly describes what components of clinical evidence should be used to perform search strategies in order to augment the inclusion of all relevant papers (Methley et al., 2014). In this review a PICOSS (*Population, Intervention, Comparator, Outcomes, Study Design and Settings*) tool was used to provide a framework for identifying the relevant papers (Boland et al., 2017). The summary of the inclusion criteria utilised to map out the most relevant clinical trials is provided in Table 7.

Table 7. PICOSS (Boland et al., 2017)

Population	Adults with cannabis-related problems who are seeking treatment
Intervention	Psychotherapeutic and psychosocial
Comparator	Inactive (e.g. delayed or no treatment) and active (standard treatment)
Outcomes	Frequency of cannabis use pre- and post-treatment Abstinence rate (continuous/point prevalence/repeated point prevalence) Self-efficacy pre/post treatment
Study Design	RCT
Setting	Hospital wards, rehabilitation centres, nursing and residential houses, outpatients, community settings, university, and delivered via computer

Population

For inclusion in the review studies must have: (1) provided information on the recruitment of the adult participants with cannabis-related problems and (2) included individuals who have exclusively been looking to seek treatment for cannabis-related problems or showed a desire to get help for quitting cannabis.

Considering the diverse pattern of cannabis use and related problems, especially with the distinction between “compulsive use” and “a pattern of cannabis use over a long time” individually associated with negative consequences in DSM-V (American Psychiatric Association, 2013); the current review was inclusive to studies recruiting participants with all levels of cannabis dependence and not necessarily requiring to meet the diagnostic criteria for CUD. Studies were excluded if they did not specify participants’ age or recruited adolescent population.

Intervention

All psychotherapeutic (also known as psychosocial) treatment studies were eligible to be included in the review. For example: CBT or MET. Pharmacological interventions were excluded.

Comparator

Studies with any type of control condition (inactive or active) in comparison with an experimental condition were eligible to be included in the current review. For example: a delayed control condition (participants in this condition wait until the completion of the treatment in experimental conditions) or a previously utilised psychotherapeutic treatment (for example, CBT).

Outcomes

Outcome measures of cannabis use (most commonly used to show the clinical effectiveness in cannabis treatment trials) such as abstinence rates, frequency of cannabis use and self-efficacy were included in the review. Included studies were required to have at least one of these outcome measures in their analysis. General practice of reporting cannabis use outcomes involves self-report, biological report, or collateral verification. Studies were excluded if they did not report quantitative outcome measures.

Study design

The design for the studies to be included in the current review was restricted to the random allocation of participants in treatment and control groups. Studies implementing this design are popularly known as *Randomised Control Trials* (RCT). Evidently, RCTs are regarded as the most suitable study design used for effectiveness reviews due to their potential to eliminate selection bias (Boland et al., 2017). The current review was inclusive to RCTs published in all languages. The exclusion criteria were based on the following factors: if studies only focused on gender differences or participants' characteristics rather than measuring treatment outcomes across treatment and control groups; if study design integrated medicine and psychotherapeutic treatment and; if studies were labelled as “pilot” or “feasibility”.

Identification of RCTs

Information sources

An initial scoping search of *Medline*, *Embase*, *PsycINFO*, *Web of Science* and *BIOSIS* was conducted; followed by searching for the keywords contained in the titles and abstracts, and of the index terms used to describe each article. Using the *MeSH* functionality from the *Ovid* search interface, *child terms* were specified from the *heading terms* to better tailor the search result. The syntax from the *Ovid* search was adapted (using a *find and replace* tool) to replicate the search criteria within *Web of Science*. *Web of Science* was also utilised to search grey literature. Additionally, the reference lists of key articles were searched.

Scoping Exercise

The scoping search was carried out using key search terms, to gain an overview of evidence relevant to the current review. The scoping exercise for the current review took place between December 8th 2019 - January 16th 2020. Studies were selected from three databases: *Medline*, *Embase* and *PsycINFO*. An additional scoping from the *Web of Science* and *Biosis databases*, was performed between February 12th 2020 - February 16th 2020. A total number of 985 studies were found from all databases combined.

Scoping search strategy

Ovid

Within the Ovid search interface, the *MeSH* (Map Term to Subject Heading) method was used to define a set of search queries related to cannabis, by isolating the term to one database, and manually selecting the *child queries* instead of exploding the search term. Initially when the parent term (which automatically includes all child terms within search) was exploded it brought too broad of a search result (included all child terms whether they were relevant or not). Therefore, *child* terms containing “cannabis” was isolated and the same process was followed to isolate the *child* terms for “treatment”. This resulted in the *Subject Headings/strings*. The *MeSH* term “cannabis” was excluded as it was broadening the search and resulting in irrelevant studies.

The quotation marks on the cannabis related search term within the Ovid search interface (e.g “cannabis use disorder”) represents a *string*, whereas the non-quotation search terms represent *Subject Headings* from exploding the initial term. Also, the operative .mp required these particular

search terms to appear within the title, abstract, heading word, table of contents, key concepts, original title, tests & measures, *MeSH* (see Appendix 3).

Web of Science

Within the Web of Science search interface, the title tag to each keyword was specified, as they do not support *MeSH* functionality.

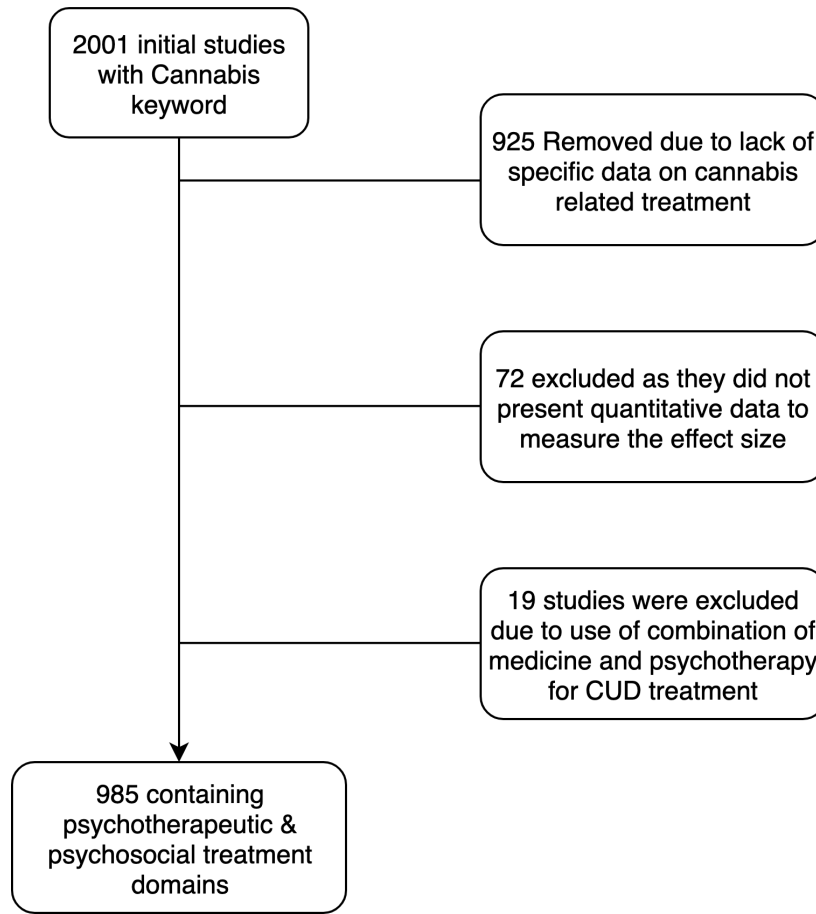
And/Or Operators

OR operator functionality was used to combine all search terms, creating a large string of relevant keywords (for example, cannabis use disorder OR cannabis dependence OR cannabis abuse). Individual search terms were queried using the *AND* operator functionality to ensure that both terms are being used within the study. For example, “treatment outcomes” and “cannabis use disorder” were both needed to be present for the search to yield a result (See Appendix 2).

Scoping results

A total number of 2001 studies were initially identified, out of which 925 were excluded because they did not contain specific data on cannabis related treatment. Of the remaining 1076 studies, 72 studies were excluded as they did not present quantitative data to measure the effect size. Nineteen studies were excluded as they dealt with the combination of medicine and psychotherapy for the treatment of CUD. The remaining 985 references, found from all databases combined, primarily focused on the treatment outcome domains typically used in psychotherapeutic/psychosocial trials to estimate the size of treatment effects (See Figure 4).

Figure 5. Study selection through scoping results



Main search strategy

For the main search strategy, search results were narrowed down using a string of *boolean operators*. The *truncation* search functionality was utilised to substitute characters for any variations of words such as: use/users/user/usage. The number of characters were specified by appending a number (for example, *3, allowing for 3 additional truncated characters). For defined search terms such as “cannabis use disorder”, quotation marks around the keyword were added forcing the words to be used in that exact order.

The main search strategy also included studies identified by searching reference lists of key articles. Moreover, the method of hand searching was also used. References of selected studies were saved in reference managing software (Endnote, X9.3.3).

Table 8. Search syntax for the main search strategy

Database (1980 - 2020)	Syntax
Medline Ovid search interface	(cannabis/ or marijuana/) and ((active adj2 us*3) or dependenc*1 or addict*3 or us*3 or "cannabis use disorder")and((psychological or psychosocial or psychotherapeutic) and (therap*5 or interventio*2 or treatmen*2 or "treatment outcom*2" or "treatment effectiv*5" or counsel?*3)).mp
Embase Ovid search interface	(cannabis/ or marijuana/) and ((active adj2 us*3) or dependenc*1 or addict*3 or us*3 or "cannabis use disorder")and((psychological or psychosocial or psychotherapeutic) and (therap*5 or interventio*2 or treatmen*2 or "treatment outcom*2" or "treatment effectiv*5" or counsel?*3)).mp
PsycINFO Ovid search interface	(cannabis/ or marijuana/) and ((active adj2 us*3) or dependenc*1 or addict*3 or us*3 or "cannabis use disorder")and((psychological or psychosocial or psychotherapeutic) and (therap*5 or interventio*2 or treatmen*2 or "treatment outcom*2" or "treatment effectiv*5" or counsel?*3)).mp
Web of Science Web of science search interface	(TI=cannabis or TI=marijuana) and (TI=active us*3 or TI=dependenc*1 or TI=addict*3 or TI=us*3 or TI="cannabis use disorder") and ((TI=psychological or TI=psychosocial or TI=psychotherapeutic) and (TI=therap*5 or TI=interventio*2 or TI=treatmen*2 or TI="treatment outcom*2" or TI="treatment effectiv*5" TI=counsel?*3))
BIOSIS Web of science search interface	(TI=cannabis or TI=marijuana) and (TI=active us*3 or TI=dependenc*1 or

TI=addict*3 or TI=us*3 or TI="cannabis use disorder") and ((TI=psychological or TI=psychosocial or TI=psychotherapeutic) and (TI=therap*5 or TI=interventio*2 or TI=treatmen*2 or TI="treatment outcom*2" or TI="treatment effectiv*5" TI=counsel?*3))

Quality assessment

All selected RCTs from the main search were assessed for quality based on the Downs & Black Scale (D&B; Downs & Black, 1998). The D&B Scale has been used for this review as it assesses the methodological quality, and risk of bias, of RCTs based on health care interventions. The current review employed the modified version of D&B Scale with the simplified power assessment question, giving a single point to evaluate whether a study has sufficient power to identify a clinically significant effect. The scale measures the quality of studies on a total score of 28. For each study, the checklist included 27 questions related to the following aspects: (a) reporting style; (b) external validity; (c) internal validity; (d) statistical power. Each paper for this review was assigned a grade of “excellent” (scoring between 24-28 points), “good” (scoring between 19-23 points), “fair” (scoring between 14-18 points) and “poor” (scoring below 14 points).

Data Extraction

Data extracted from each RCT included: characteristics of the study (e.g., type of intervention, year of publication, number of patients, duration of treatment); methodological design of the study (for example, intention to treat, blinding); and characteristics of the sample (age, gender). Data extracted for each primary outcome (for example, abstinence rates, frequency of cannabis use and self-efficacy) included:

1. Assessment methods for frequency of cannabis use (biological and self-reported)
2. Time-window for measuring the change in cannabis use
3. Measurements of abstinence (continuous, point-prevalence)
4. Assessments of self-efficacy before and after treatment
5. Methods of determining the strength of experimental effect (effect size)

Additionally, data extraction form was created for this review using Microsoft Excel. Data extracted for a meta-analysis included full information on mean, standard deviation, and sample size for frequency of cannabis use outcome.

Data Synthesis

The main purpose of this review was to provide a narrative synthesis of the characteristics and methodology of RCTs taken place relating to the psychotherapeutic treatments for cannabis; description of the primary outcome domains; outcome measures; compilation of the list of instrument used (self-report and biological); categorisation of methodological aspects of measuring the primary outcomes and where possible: description of the differences in treatment and comparison group in outcome measures.

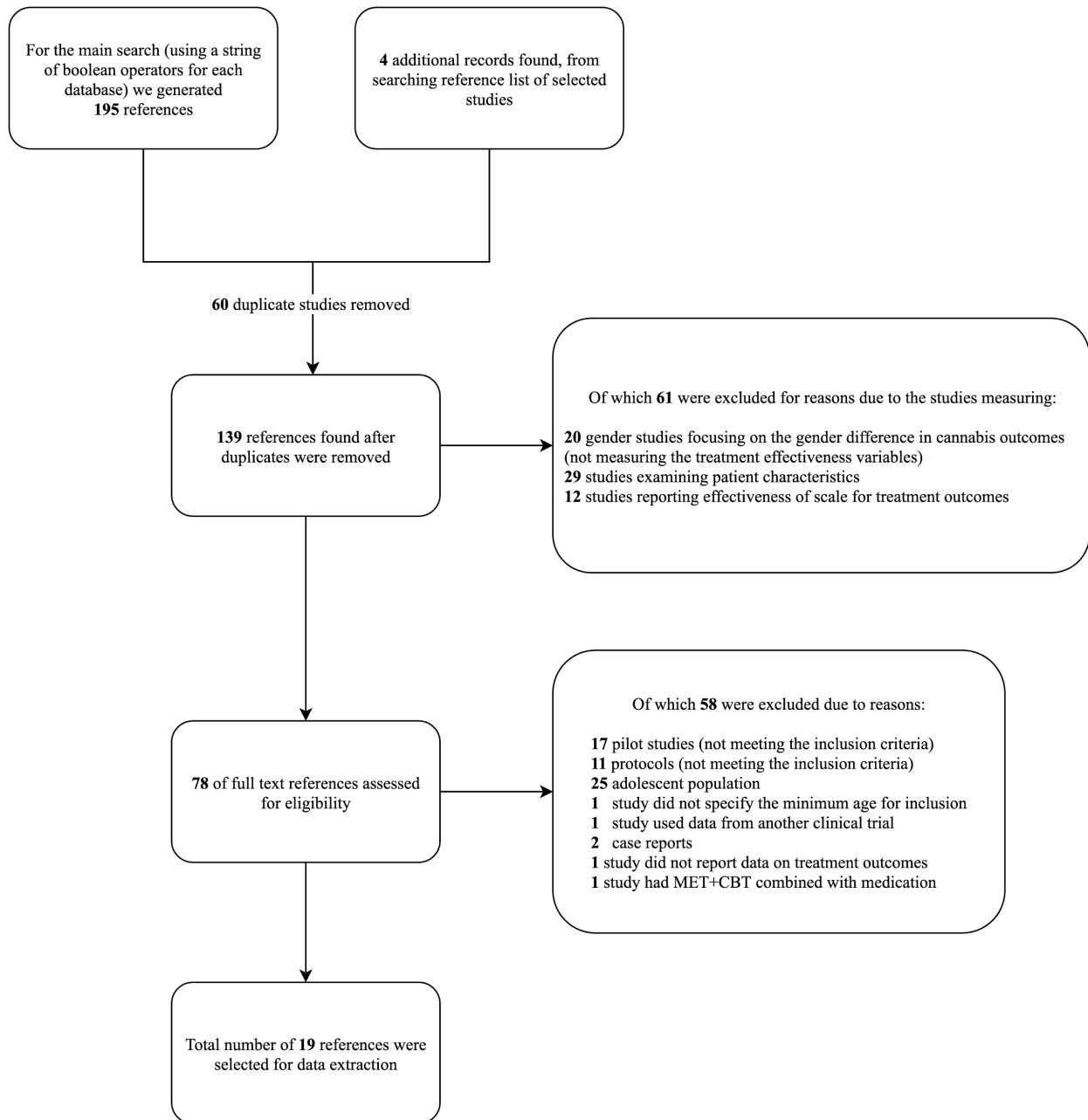
Identification of sufficient studies similar in terms of outcome measured, participants involved, and interventions used led to assume that a meta-analysis was possible. Meta-analysis was performed using Revman Version 2.0. The standardized mean difference (SMD) measure of effect between the treatment and control groups was evaluated as the studies measured effectiveness in terms of a continuous measurement such as “frequency of cannabis use in a specific time interval”. To perform this analysis studies were selected based on full information provided on mean,

standard deviation and sample size for both treatment and control conditions and employment of a delayed treatment condition for the control group.

Results

The implementation of the described search strategy led to the selection of 19 RCTs for data extraction. Details of the study-selection process through the main search results is provided in Figure 5. The trend in the publication of RCTs is displayed in Figure 6. Characteristic details of each included RCT and methodological aspects are displayed in Table 9. Results on frequency of cannabis use (mean number of days) before and after treatment are provided in Table 10. Similarly, details of proportion of participants being abstinent and mean days of abstinence in treatment and control group, are presented in Table 11 and Table 12 respectively.

Figure 6. Selection of studies through the main search results



Study quality

The modified version of the D&B checklist (Appendix H) was simplified for rating the power analysis item (item 27). Instead of rating according to the available range of study power (using five points), the modified version of checklist allowed reviewer to assign a single point to this

question to indicate whether a study has performed a power analysis or not. So, the maximum scores which can be obtained from the checklist was 28 instead of 32. On average, the papers scored 23.7 out of 28 points, which were graded as “good” quality. Carroll et al., (2006) study scored the highest (27) whereas, Babor et al., (2004), Litt et al., (2008) and Budney et al., (2015) scored the lowest (22) points.

All selected RCTs were conducted between the time period of January 1, 1993, and December 31, 2019. The year 2006 yielded the maximum number of RCTs (Carroll et al., 2006; Budney et al., 2006 and Lozano et al., 2006) carried out on the effectiveness of psychotherapeutic treatments for cannabis use. There appears to be a scarcity of evidence in this area, between the years 1995 and 1999. However, there has been a growing number of RCTs documented from the 2000s onwards.

Study Characteristics

Details of study characteristics are presented in Table 9. All selected RCTs were based in the US, with the exception of Copeland et al., (2001) which was based in Australia. Majority of the studies (68.4%) did not permit alcohol or other drug dependence in the sample. Whereas 31.5% of the studies permitted use or abuse of alcohol, nicotine or other drugs in the sample (Babor et al., 2004; Carroll et al., 2012; Copeland et al., 2001; Litt et al., 2013; Litt et al., 2019; Stephens et al., 2002). In total the papers included 3528 participants (aged 18-66 years), with an average of 208 participants per study. Stephens et al., (2002) and Babor et al., (2004) recruited the highest number of participants ($n = 450$), whereas Budney et al., (2000) enrolled the lowest ($n = 60$). Only 3 studies reported overall dropout: Carroll et al., (2012) ($n = 127$, dropouts = 58), Kadden et al., (2007) ($n = 240$, dropouts = 40) and Litt et al., (2013) ($n = 215$, dropouts = 33). All papers specified numerical data on gender. Most of the studies recruited men (71.7%), with fewer studies recruiting

women (28.3%). Eighty nine percent of the papers reported ethnicity of the participants, conversely, 11% did not present ethnicity data (Copeland et al., 2001 and Litt et al., 2013). The mean percentage of each ethnic group across all papers were: 74.2% Caucasian; 39.2% African American; 14.8% Hispanic; 0.7% Asian; and 8.8% other.

The majority of the studies 94.7% examined psychotherapeutic treatments in an outpatient setting, however, Budney et al., (2015) delivered computer-assisted MET combined with CBT and CM (MET/CBT/CM - COMPUTER) treatment via computer. There were a wide range of treatment groups, in comparison with control groups (inactive/active), included across all studies. In the treatment groups, 84.2% ($n = 16$) of the papers incorporated CBT; 78.9% ($n = 15$) examined MET; and 42.1% ($n = 8$) assessed CM. Additionally, 15.8% of the papers ($n = 3$) utilised treatments such as *Abstinence Based Voucher* (V), *Individualised Assessment and Treatment Program* (IATP) and *Multi-media Feedback* (MMF). In the control/comparison group 26.3% studies ($n = 5$) had a delayed treatment control group, in which participants waited for a specific amount of time for assessment follow-up and were provided with the choice to initiate any of the study's treatments at the end of the study. Fifteen percent of the papers ($n = 3$) had CM as an active control condition which focused on the educational aspects of negative consequences of cannabis use without teaching any skills (for example, encouraging to feel a sense of reward in quitting cannabis). The other comparison groups consisted of either a standardised version of counselling typically delivered in a community setting, delayed or no feedback conditions or a social support condition: Delayed Control (DC); No check-up condition (NCU); Social Support Intervention (SSP); Delayed Feedback Control (DFC); Motivational Enhancement Therapy combined with Cognitive Behavioural Therapy (MET+CBT).

Moreover, the treatment length varied across all selected papers with an average of 12 weeks. RCTs with the highest treatment length of 17 weeks were Stephens et al., (2000), Stephens et al., (1993), and Lozano et al., (2006) with - *Relapse Prevention Intervention* combined with *Individualised Assessment/Advice* and *Delayed Treatment Control* (RPSG/IAI/DTC); *Relapse Prevention* and *Social Support Intervention* (RP/SSP); and *Relapse Prevention* in addition to *Individualised Assessment/Advice* and *Delayed Treatment Control* (RPSG/IAI/DTC) - treatment groups respectively. Whereas, Babor et al., (2004) with MET, CBT and Delayed Treatment Control (MET/MET+CBT+CM/DTC) groups had the shortest treatment length of 5 weeks for MET.

Table 9. Methodological details of included RCTs

Studies	Country	Symptom/diagnostic measure	<i>N</i>	Treatments received by control groups	Treatment received by treatment group	Follow-up retention	Intention to treat (and management of missing data)	Single-blind follow-up
Babor et al., 2004	USA	DSM-IV, TLFB, Collateral interviews	450	BL: no treatment, 4month: 23.7% chose 2-session intervention, 63.5% chose 9 session and 12.8% chose neither treatment	MET, MET + CBT + CM for 5-13 weeks	At 4-month follow-up: 2 MET (87.7%), 9 MET+CM (85.3%), DTC (92.6%)	No	No
Banes et al., 2014	USA	DSM-IV, TLFB	73	BL: 9MET+CBT treatment without check-up for 3 months	MCU for 13 weeks	At 3-month follow-up: overall 86.3% from both conditions	No	N/S
Budney et al., 2000	USA	DSM-III-R, DAST	60	BL: MET for 12 weeks	MBTV, MBT for 14 weeks	At 3-month follow-up: MBTV (55%), MBT (65%), M (45%)	Yes	N/S
Budney et al., 2006	USA	DSM-IV-TR, TLFB	90	BL: CBT for 14 weeks	CBT+V, V for 14 weeks	N/S	Yes	No

Budney et al., 2015	USA	DSM-IV, TLFB	75	BL: BRIEF for 12 weeks	COMPUTER, THERAPIST for 12 weeks	At 3-month follow-up: COMPUTER (67%), THERAPIST (73%), BRIEF (69%)	Yes	N/S
Carroll et al., 2006	USA	DSM-IV, TLFB	136	BL: standardised version of counselling for (DC) for 8 weeks	MET/CBT+CM, DC/CM, MET/CBT for 8 weeks	At 2-month follow-up: MET/CBT+CM (69.7%), MET/CBT (66.7%), DC+CM (63.6%), DC (39.4%)	Yes	N/S
Carroll et al., 2012	USA	DSM-IV, TLFB	127	BL: CBT for 12 weeks	CM abst,CM abst + CBT,CM adher + CBT for 12 weeks	Proportion of participants who at least reached one follow-up: overall 84% from all conditions	No	N/S
Copeland et al., 2001	Australia	NR, OTI	229	BL: no treatment (DTC), 4-month follow-up: offered a choice of 6CBT or 1CBT	6 CBT, 1 CBT for 12 weeks	At 3-month follow-up: overall 6.5% completed the treatment	Yes	Yes
Kadden et al., 2007	USA	DSM-IV, TLFB	240	BL: CaseM (educational regarding negative effects of cannabis) for 9 weeks	MET + CBT, ContM,MET+CBT+ContM for 9 weeks	N/S	No	No

Litt et al., 2013	USA	DSM-IV, TLFB	215	BL: CaseM (educational regarding negative effects of cannabis) for 9 weeks	MET+CBT+CM home, MET+CBT+CMabst for 9 weeks	N/S	N/S	No
Litt et al., 2008	USA	DSM-IV, TLFB	240	BL: CaseM (educational regarding negative effects of cannabis) for 9 weeks	MET+CBT, Cont M, MET+CBT+ContM for 9 weeks	N/S	N/S	N/S
Litt et al., 2019	USA	DSM-IV, TLFB	198	BL: MET+CBT for 12 weeks	MET+CBT+CM, IATP, IATP+CM for 9 weeks	N/S	No	Yes
Lozano et al., 2006	USA	N/S, self-report questionnaire, collateral verification	291	BL: initial waiting period for 4 months (DTC), choice of IAI/RPSG treatment provided following the waiting period	IAI/RPSGabsgoal, IAI/RPSGmodgoal for 17 weeks	At 4-month follow-up: overall 86% remained in the study	No	No
Stephens et al., 1993	USA	N/S, TLFB, Collateral interviews	212	BL: SS (social support) for 12 weeks	RP for 4-17 weeks	At 3-month follow-up: overall 79% of all sample remained in the study	N/S	N/S

Stephens et al., 1994	USA	N/S, self-report questionnaire, collateral verification	212	BL: SSP (social support) for 12 weeks	RP for 12 weeks	At 3-month follow-up: overall 79% of all sample remained in the study	N/S	N/S
Stephens et al., 2000	USA	N/S, self-report questionnaire, collateral verification	291	BL: waiting period for 4 months (DTC), choice of IAI/RPSG treatment provided following the waiting period	RPSG, IAI for 4-17 weeks	At 4-month follow-up: overall 86% of all sample remained in the study	No	No
Stephens et al., 2002	USA	TLFB, Collateral interviews	450	BL: no treatment for 4 months (DTC), choice of 9MET+CBT+CM or 2MET treatment provided following the waiting period	CBT+MET+CM, MET for 12 weeks	N/S	No	No
Stephens et al., 2007	USA	DSM-IV, TLFB	188	BL: waiting period for 7 weeks (educational control condition-	PF, MMF for 7 weeks	At 7-week follow-up: PF (89%), MMF (94%), DFC (52%)	No	No

DFC), choice of
feedback
intervention
provided
following the
waiting period

Walker et al., 2015	USA	DSM-IV, TLFB	74	BL: 9MET/CBT for 12 weeks without additional MET-based check-up at the 4th and 7th month from baseline	MCU for 12 weeks	At 3-month follow- up:MCU (97%), NCU (76%)	No	No
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Note: TLFB = The Timeline Followback; OTI = The Opiate Treatment Index; DAST = The Drug Abuse Screen Test, BL: at baseline MET = Motivational Enhancement Therapy; CBT = Cognitive Behavioural Therapy; CM = Contingency Management; DTC = Delayed treatment Control; MCU = Maintenance Checkup; NCU = No Checkup; MBTV = Motivational Behavioural Training + Abstinence based Voucher; MBT= Motivational Behavioural Coping Skills Therapy; M = Motivational Enhancement; V = Abstinence Based Voucher; COMPUTER = computer-delivered MET/CBT/CM; THERAPIST = therapist-delivered MET/CBT/CM; BRIEF = MET only; DC = Delayed Control; CM abs = Contingency Management Abstinence; CM adher = Contingency Management Adherence; ContM = Contingency Management; CM home = homework-based CM; IATP = Individualised Assessment and Treatment Program; IAI = Individualised Assessment and Intervention; RPSG = Relapse Prevent Support Group; RP =Relapse Prevention Intervention; SSP=Social Support Intervention; PF = Personalised Feedback, MMF = Multi-media Feedback; DFC = Delayed Feedback Control; MCU = Posttreatment Maintenance Check-Ups; NCU = No Check-Up; N = total number of participants in the study, N/S = not specifies

Cannabis Use Outcomes

In total, 68.4% of the studies ($n = 13$) recruited participants who met DSM-IV criteria for cannabis abuse and dependence. Budney et al., (2000) used the inclusion criteria of DSM-III-R for cannabis dependence and Budney et al., (2006) used the inclusion criteria of DSM-IV-TR for cannabis abuse and dependence. In addition, 21% studies ($n = 4$) did not specify the diagnostic criteria used to enrol participants. Only Copeland et al., (2001) exclusively mentioned “not requiring” a DSM-IV abuse or dependence criteria for study participation.

Of 13 studies reporting mean days of cannabis use, 53.8% ($n = 7$) measured in terms of *90 days* prior to the treatment and each follow-up. Of these studies, Lozano et al., (2006) did not present the numeric data whereas, Litt et al., (2019) and Stephens et al., (2002) did not report the post-treatment cannabis use. Furthermore, 23% studies ($n = 3$) reported cannabis use outcomes in terms of mean days of use in the last *30 days* pre-treatment and follow-up. Similarly, Carroll et al., (2006 and 2012) evaluated mean days of use in the last *28 days* and Stephens et al., (2007) measured the same in terms of mean days of *use per week*. The majority of the studies calculated cannabis use outcomes for each treatment group with the exception of Banes et al., (2014) and Stephens et al., (1994); which reported an aggregate score of participants across all treatment groups.

To note, 26.3% studies ($n = 5$) did not report cannabis use with regards to mean days of use, instead they reported the amount of cannabis used in a particular time window. For example, Copeland et al., (2001) reported the change in the daily consumption using the Opiate Treatment Index (Deering & Sellman, 1996). Kadden et al., (2007) (which is the part of Litt et al., 2008) and Litt et al., (2013) reported the estimated joints smoked per day in the last 60 days, whereas Stephens et al., (1993) measured cannabis use episodes per month prior to treatment and 3-month follow-up.

The average follow-up period across all studies was 2-4 months. The details of the studies which reported the mean days of cannabis use prior to the treatment and at a certain time window before the follow-up, are presented in Table 10.

TLFB was the most commonly used self-report measure to determine the frequency of cannabis use within the range of the past 90 days. In total, 73.6% studies ($n = 14$) used TLFB measure, out of which: 15.7% studies ($n = 3$) combined it with collateral verification (confirmation of user's cannabis use from someone who is connected to the user but has less importance in their life). Furthermore, Budney et al., (2000) and Copeland et al., (2001) reported the use of DAST and OTI measures, respectively. In addition, Stephens et al., (1994 and 2000), utilised retrospective diary or calendar method in addition to collateral verification. Finally, Lozano et al., (2006) reported the self-reported cannabis use, however, did not provide further detail.

Table 10. Studies reporting mean days of cannabis use in treatment and control groups

Studies	Treatment groups	Baseline		2–4-month follow-up		Between-group effect size
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Mean days of cannabis use in the last <i>90 days</i> prior to treatment and follow-up						
Babor et al., 2004	9CBT+CM+M	87.56	17.24	36.17	38.83	9CBT+CM+M vs DTC , <i>d</i> = 1.14 2MET vs DTC , <i>d</i> = .59
	2MET	86.92	17.15	55.86	36.18	
	DTC	89.88	14.11	75.59	30.69	
Budney et al., 2015	COMPUTER	78.0	17.1	26	N/S	N/S
	THERAPIST	81.2	13.8	21	N/S	
	BRIEF	74.8	17.7	36	N/S	
Walker et al., 2015	MCU	84.41	26.31	25.52	33.57	MCU vs NCU , <i>d</i> = 0.88
	NCU	85.55	25.74	50.37	43.62	
Mean days of cannabis use in the last <i>30 days</i> prior to treatment and follow-up						
Budney et al., 2000	MBTV	24.1	7.3	6.6	2.6	No significant difference between groups
	MBT	20.4	9.9	7.4	2.3	
	M	23.2	8.4	13.0	2.1	

Budney et al., 2006	CBT+V	25.3	8.0	9.7	9.1	No significant difference between groups
	V	26.0	6.2	11.3	9.7	
	CBT	25.5	7.4	8.6	9.2	
Stephens et al., 2000	RPSG	25.38	6.15	6.68	9.87	IAI vs RPSG, $\eta^2 = .03$
	IAI	24.24	6.29	7.88	10.98	
	DTC	24.85	6.13	17.09	10.73	

Mean days of cannabis use in the last 28 *days* prior to treatment and follow-up

Carroll et al., 2006	MET/CM	13.8	10.3	8.1	N/S	No significant difference between groups
	MET/CM	12.4	9.8	8.3	N/S	
	DC+CM	13.7	11.2	6.2	N/S	
	DC	12.5	10.3	10.9	N/S	
Carroll et al., 2012	CBT+CM	17.6	8.6	9.6	10.3	N/S
	CBT+CM	17.9	9.6	13.8	12.4	
	CM	14.1	10.6	8.9	12.6	
	CBTalone	15.6	9.8	9.96	12.0	

Mean days of cannabis use *per week* prior to treatment and follow-up

Stephens et al., 2007	PF	5.76	0.15	4.74	0.24	PF vs MMF, $d = 0.42$
	MMF	5.79	0.15	5.44	0.24	
	DFC	6.06	0.15	5.75	0.24	PF vs DFC , $d = 0.47$

Note: Between-group effect size column represents the magnitude of the experimental effect, i.e., of treatment groups as compared to the control group; group names in **bold text** were control group conditions; Abbreviations: DTC = Delayed Treatment Control; BRIEF = MET only; NCU = No Checkup; M = Motivational Enhancement; CBT = Cognitive Behavioural Therapy; DC = Delayed Control; DC+CM = DC and Contingency Management; DFC = Delayed Feedback Control; d = Cohen's d ; η^2 = eta squared; *N/S* = not specified

Abstinence outcomes

All studies accounted for the rate of abstinence achieved during the treatment. However, Banes et al., (2014), Stephens et al., (1993), Stephens et al., (2002) and Stephens et al., (2007) did not

present the numerical data on abstinence measures. Of the 15 studies which presented numerical data, Litt et al., (2019) did not report the standard deviations of the mean days of abstinence during each month at 14-month follow-up. Lozano et al., (2006) did not report the proportion of participants abstinent in the DTC group. Similarly, Kadden et al., (2007) did not report the longest period of continuous abstinence during 12 months for each treatment group.

In total, 63.1% of selected studies ($n = 12$) reported full data on abstinence outcomes for both treatment and control groups. Studies reported abstinence rate in terms of “mean number of days participants reported being abstinent” or “proportion of participants (in each treatment group) reported abstinence” during a certain time interval. In regard to the methodological aspects of calculating abstinence, of the papers presenting full data on abstinence outcome: 58.3% calculated *continuous abstinence* (between quitting days and follow-up time); 41.6% measured *point-prevalence abstinence* (during a time window before the follow-up); and 16.6% reported *repeated point prevalence* (point prevalence abstinence at two or more follow-ups between which smoking is allowed). Across all studies *urine toxicology screening* ($n = 8$, 42.1%) and *TLFB* ($n = 7$, 36.8%) was the most common method of determining abstinence. Nonetheless, Stephens et al., (1994 and 2000) reported the use of self-report via retrospective diary or calendar method combined with collateral verification. Furthermore, Banes et al., (2014), Lozano et al., (2006) and Stephens et al., (1993) did not specify the instruments used to measure abstinence. Table 11 and 12 presents numeric data from the studies which reported the following variables: type of abstinence measure; mean number of days being abstinent; proportion of participants reported abstinence in both treatment and control groups; and the extent of the difference between treatment and control group (effect size).

Table 11. Studies reporting proportion of participants being abstinent in treatment and control groups

Studies	Abstinence measures	Treatment group	Control group	Between-group effect size
Babor et al., 2004	Point-prevalence abstinence for preceding 90 days at 4-month follow-up	22.6% 9CBT+CM+ME T; 8.6% 2MET	3.6% DTC	<i>N/S</i>
Budney et al., 2000	Continuous abstinence during 14-weeks treatment	50% MBTV; 30% MBT	10% M	MBTV vs M/MBT, $f = .40$
Budney et al., 2006	6 or more weeks of continuous abstinence achieved during treatment	40% CBT+V; 50% V	17% CBT	V vs CBT, $OR = 6.0$ CBT+V vs CBT, $OR = 4.07$
	Point prevalence abstinence preceding 90 days at 12-month follow-up	37% CBT+V; 17% V	23% CBT	CBT+V vs CBT, $OR = 2.45$ CBT+V vs V $OR = 2.17$
Budney et al., 2015	Longest duration of continuous abstinence during 12-week treatment	44.8% THERAPIST; 46.7% COMPUTER	12.5% BRIEF	THERAPIST vs BRIEF, $ES = .71$
Carroll et al., 2006	Longest duration of continuous abstinence during 8-week treatment	46% MET/CBT+CM; 31% MET/CBT	21% DC 44% DC+CM;	CM vs no CM, $d = .45$
Copeland et al., 2001	Continuous abstinence from the end of the 12-week	15.1% 6CBT, 4.9% 1 CBT	0% DTC	<i>N/S</i>

	treatment to 24-week follow-up			
Litt, 2008	Repeated point prevalence abstinence recorded every 90 days for 12 months post-treatment follow-up	12.7% MET/CBT; 22% ContM; 18.6% MET/CBT+ContM	11.1% CaseM	ContM vs CaseM, $OR = 1.95$
Stephens et al., 1994	Repeated point-prevalence abstinence 90 days prior to 1 month, 3 month and 9 month follow-ups post-treatment	1 month: 49% RP 3 months: 33% RP 9 months: 19% RP	1 month: 50% SSP 3 months: 40% SSP 9 months: 24% SSP	N/S
Stephens et al., 2000	Point-prevalence abstinence 28 days prior to the 4-month post-treatment follow-up	44% RPSG; 39% IAI	17% DTC	RPSG/IAI vs DTC, $\phi = .25$
	Point prevalence abstinence 90 days prior to the 4-month post-treatment follow-up	37% RPSG, 37% IAI	9% DTC	RPSG/IAI vs DTC, $\phi = .29$
Walker et al., 2015	Point-prevalence abstinence 90 days prior to 9-month post-treatment follow-up	(MCU) N/S	(NCU) N/S	MCU vs NCU, $OR = 24.95$

Note: Between-group effect size column represents the magnitude of the experimental effect, i.e., of treatment groups as compared to the control group; Abbreviations: f = Cohen's f ; OR = Odds Ratio, ϕ = Phi; d = Cohen's d ; ES = effect size; N/S = not specified

Table 12. Studies reporting mean days of abstinence during treatment

Studies	Abstinence measures	Treatment conditions	M	SD	Between-group effect size
Budney et al., 2000	Longest period of continuous abstinence during treatment (in weeks)	MBTV	33.6	4.9	MBTV vs MBT/ M , $f = 0.40$
		MBT	16.1	3.0	
		M	11.2	2.4	
Budney et al., 2006	Continuous abstinence during 14-week treatment	CBT+V	37	4.7	V vs CBT , $d = .71$
		V	48.3	5.4	
		CBT	24.5	3.2	
Carroll et al., 2012	Continuous abstinence during 12-week treatment	CBT+CMadhr	33.9	23.7	<i>N/S</i>
		CBT+CMabst	28.8	30.5	
		CMabst	33.8	30.5	
		CBTalone	35.8	29.8	
Litt et al., 2013	Continuous abstinence during 9-week treatment	MET+CBT+CMhome	18.65	23.74	<i>N/S</i>
		MET+CBT+CMabs	27.95	25.17	
		CaseM	19.45	24.13	
Litt, 2008	Continuous abstinence during 9-week treatment	MET/CBT	19.25	27.24	<i>N/S</i>
		ContM	28.23	30.41	
		MET/CBT+ContM	25.80	31.97	
		CaseM	17.27	25.88	

Note: Between-group effect size column represents the magnitude of the experimental effect, i.e., of treatment groups as compared to the control group; group names in **bold text** were control group conditions; Abbreviations: M = Motivational Enhancement; CBT = Cognitive Behavioural Therapy; CaseM = Case Management; f = Cohen's f , d = Cohen's d ; *N/S* = not specified

Self-efficacy as a mechanism of behaviour change

Self-efficacy, which means the confidence in oneself to resist from taking cannabis has been measured as an important mediating factor in cannabis treatment. Increase in self-efficacy from treatment admission to post treatment follow-ups has shown to decrease the amount of cannabis used over a long period. Of the included studies, 36.8% studies ($n = 7$) analysed self-efficacy outcomes pre- and post-treatment. All studies utilised *the Marijuana Self-Efficacy Questionnaire*, which was adapted from the measure of *Smoking Cessation Self-Efficacy Questionnaire* (originally designed for tobacco) (Litt et al., 2005; Stephens et al., 1995), with an internal reliability of $\alpha = .89$ (Litt et al., 2013). In the questionnaire, participants were asked to rate how confident they felt about not taking cannabis in 20 high-risk situations on a scale of 1 (not at all confident) to 7 (very confident at avoiding cannabis).

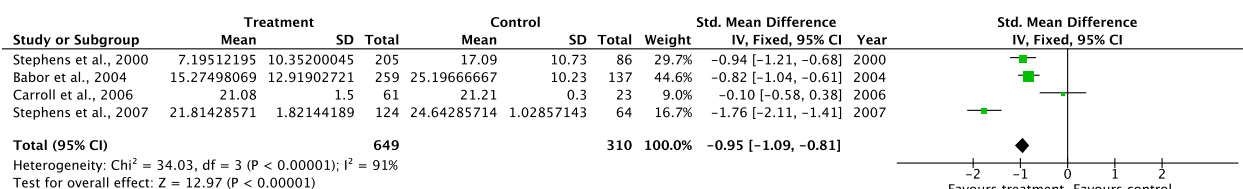
Litt et al., (2013) and Litt et al., (2008) found higher levels of self-efficacy to be associated with abstinence over time (at 14-month follow-up), for CM treatment group ($r = .41$) and MET/CBT+ContM treatment group ($r = 0.29$). Similarly, Litt et al., (2019) reported that self-efficacy was a significant mediator of IATP treatment ($z = 2.14$) on the proportion of days abstinent over 14-month follow-up. Additionally, Stephens et al., (1993) reported that regardless of the treatment, the self-efficacy variable was a significant and consistent contributor to predict decrease in cannabis use over a 12-month follow-up ($R^2 = .04$).

Results from Meta-analysis

A meta-analysis was conducted to estimate the effects of treatment groups versus delayed treatment conditions for reducing the frequency of cannabis use. Studies which met the criteria for a meta-analysis were Babor et al., 2004; Carroll et al., 2006; Stephens et al., 2000 and Stephens et

al., 2007. Selected studies were similar in regard to the treatment outcome (frequency of cannabis use) and control condition (delayed treatment control). Of these studies, Stephens et al., 2000 did not report the diagnostic criteria used for recruiting participants. For this reason, a heterogeneity between studies was anticipated, therefore the random-effects model was utilised. The plot in Figure 6 shows an advantage of treatment groups over the control group. As shown in the figure the point estimates are all on the treatment side of the vertical axis, which indicates that all studies favoured the treatment group as compared to the control group. Similarly, the diamond, which shows the pooled effect estimate, is also on the treatment group side (SMD = -.95, 95% CI = -1.09, -.81), thus representing a statistically significant effect favouring the treatment over control. Since the improvement was associated with lower values (fewer days of cannabis use), SMD value lower than zero indicates that the treatment group is more efficacious than the control group. However, it is important to note that there was a substantial heterogeneity between the studies, which was not due to the chance. A low p value of .00001 and a large Chi-Squared value corresponding to degree of freedom ($X^2 = 34.03$, $df = 3$) shows heterogeneity in effects estimates. Furthermore, I^2 statistics shows that there is 91% variability in effect estimates that is caused by the heterogeneity instead of by chance.

Figure 7. Estimates of treatment effects as compared to delayed treatment control conditions for frequency of cannabis use outcome



Discussion

The main purpose of this review was to map out the evidence pertaining to the effectiveness of psychotherapeutic treatment for cannabis-related issues. The review provided an overview of the characteristics of cannabis treatment trials, showing how key end-of-treatment outcomes were measured and reported.

The findings from the selected RCTs indicated the following: first, there has been a growing trend in publication of cannabis treatment trials since the 2000s onwards with year 2006 publishing the most RCTs, however most studies were conducted in the US. Second, the majority of the studies (53.8%) measured continuous abstinence during the treatment. Of studies providing strong evidence of the effectiveness with an inactive control group, Carroll et al., (2006), showed higher rates of continuous abstinence of CM treatment condition than Delayed Control condition with moderate effect size ($d = .45$). Third, difference in cannabis use pre- and post-treatment, in the longest time window of TLFB (90 days prior to follow-up); Babor et al., (2006) showed that 9-session CBT combined with CM and 2-session MET groups had higher reduction in cannabis use at the 2–4-month follow-up period ($d = 1.14$ & $d = .59$ respectively) versus Delayed Treatment Control. Fourth, of the studies which reported the effect size of both self-efficacy and abstinence outcomes - Litt et al., 2008 reported that change in self-efficacy predicted long-term (14 months) abstinence and there was a direct effect of CM treatment condition with effect size $r = .25$. CM treatments which are based on the principle that - if individuals' behaviour is followed by rewarding consequences, they are more likely to repeat that behaviour - have consistently been reported to increase self-efficacy during treatment in cannabis literature. Lastly, meta-analysis results showed the superiority of treatment group over control group, however, results cannot be generalised due to high heterogeneity between studies.

The current review provides a visual and narrative description of a range of characteristics of the selected studies. As stated earlier 95% of the studies were based in the US and not a single study in the UK. While evidence-based trials yield unbiased and accurate estimates of effect of treatment, they do not necessarily provide information about the generalizability of these effects in other contexts and locations among diverse populations (Stuart et al., 2015). Such is the case with cannabis treatment trials based in the US. For example, cannabis-related harm in the US population may differ in various ways from the UK, through variable legality (in some states) and easier availability in some areas (Wadsworth & Hammond, 2019). Additionally, organisational difference in treatment services between the US and the UK may determine the type of individuals who would benefit from treatment and barriers they would perceive (Ham, 2005). For example, although SUD treatments in the US are mostly funded by local, state or federal government, a large number of people use health insurance cover to access treatment with around 45 million under the age of 65 not having insurance and reporting healthcare costs as a barrier to treatment (Ham, 2005). Due to these differences in target population between the US and the UK, it becomes particularly difficult for clinicians and policy makers to recommend US-based treatment programs as these may not be effective or straightforward to implement in the UK.

Additionally, studies recruited a disproportionately high rate of men compared to women. One possible reason for why this might happen is that women are less likely to use cannabis regularly and become dependent than men (Khan et al., 2013). Existing evidences on gender gap in cannabis use also shows women's increased perception of harm concerned with regular cannabis use (Hellemans et al., 2019). Another reason documented in previous studies is the gender differences in barriers to treatment-seeking for cannabis (Copeland, 1997). A previous review on the effects of self-stigma among individuals with drug and alcohol use disorders showed that women felt they

were more stigmatised for being dependent on drugs than men, which prevented them from seeking treatment (Hammarlund et al., 2018). Taken together these findings indicate that subjective need for treatment could potentially be different for women than men, depending on their experience of harm, barriers to treatment, risk factors, reasons for and levels of use. Thus, a gender-tailored treatment approach in future may benefit women seeking help for cannabis.

With the changing diagnostic criteria for cannabis dependence, it is crucial to understand how these changes currently correspond with the effectiveness of treatments. Although the withdrawal criteria for cannabis use is documented in both DSM-IV and DSM-V, it has been modified in DSM-V to provide a complete diagnostic criteria for CUD (Substance Abuse and Mental Health Services Administration, 2016). DSM-V addresses multiple withdrawal symptoms associated with cannabis use, which was not taken into account in DSM-IV (Substance Abuse and Mental Health Services Administration, 2016). Notably, 21% of the selected RCTs were published after the publication of DSM-V, however, none of the studies with the exception of Litt et al., (2019), mentioned how these diagnostic criteria of DSM-IV correspond to the clinically evolved definition of CUD in DSM-V. A large number of studies employed DSM-IV criteria and a few older studies used DSM-III criteria for cannabis dependence. Similarly, all studies besides Copeland et al., 2001, exclusively recruited participants with cannabis abuse or disorder (DSM-IV/DSM-III). Considering the different levels of harm experienced by the cannabis-using population with diverse patterns of use and considerable recent attention given on what should be classified as “risky” or “problematic use”; it becomes crucial for RCTs to recruit individuals experiencing a wide range of harm to observe the limitations in cannabis literature (Asbridge et al., 2014). One previous study on the issues with identification of problematic cannabis use, offered a similar perspective: “the identification of problematic cannabis use disproportionately relies on measures

of the frequency of cannabis consumption rather than the harms experienced” (Asbridge et al., 2014 para.1). Additionally, of selected studies which permitted the use and abuse of alcohol or other drugs in the sample, Babor et al., (2004) reported no evidence of association between decrease in cannabis use and increase in alcohol use, further suggesting that individuals with cannabis problems (without other drug dependence) are underrepresented in existing clinical settings. This may also be evidenced by the fact that “treatment is not tailored to my symptoms” is a commonly reported barrier to treatment-seeking.

Furthermore, with regards to treatment, previous studies have shown that computerised treatments have become increasingly popular for cannabis-related problems (Sherman & McRae-Clark, 2016). However, findings of the current review show that there is a scarcity of RCTs examining the clinical effectiveness of computer-based interventions. The present review found one RCT (Budney et al., 2015) analysing a computer-assisted treatment. Notably, lack of alternative treatment options has previously been reported as a significant barrier among individuals not seeking treatment for cannabis dependence. Nonetheless, CBT, MET, and CM remains the most popular treatment for CUD and was widely used across all studies in the current review. As mentioned in Chapter 1, several research studies have emphasised the combination of these three treatments produces the best results for cannabis-related problems (Budney et al., 2006; Litt et al., 2013). Moreover, in the present review merely 36.8% of the selected studies measured self-efficacy outcomes, out of which 4 studies (Litt et al., 2013; Litt et al., 2008; Litt et al., 2019 and Stephens et al., 1993) reported the effect size of self-efficacy in improving abstinence outcomes. Consistent with cannabis literature, among studies which reported self-efficacy variables, CBT/MET/CM treatments showed the highest self-efficacy corresponding abstinence rate over a long period of time.

To measure clinically relevant outcomes, it is crucial to reach a consensus regarding the inclusion and measurement of outcome domains. The current review found that there is a lack of standardisation in reporting and measuring of outcome domains in cannabis RCTs. Cannabis use and abstinence rates were the most common outcomes across all RCTs. Nonetheless, there was a great variability across studies in methods of measuring these outcomes. For example, of studies reporting numerical data on cannabis use outcomes, 68% measured frequency of use frequency and 26.3% calculated quantity of use. Although quantity of cannabis use was not the primary outcome measure of the current review, it was crucial to highlight evidences on how cannabis RCTs measure cannabis use outcome domains. Additionally, selected RCTs were inconsistent in the measurement of abstinence rates. Of studies reporting abstinence, 52.6% calculated proportion of participants being abstinent and 26.3% measured mean days of abstinence.

Similar to the current review, two previous studies in the past have highlighted the lack of standardisation in the selection and reporting of outcome measures as a key challenge in determining clinically meaningful effectiveness of treatment (Lee et al., 2019; Peters et al., 2011). In addition, with regards to missing data, it is crucial to note that only four RCTs (15.7%), in the present review, provided numeric information on dropouts. One possible reason for the lack of information about study drop-outs could be the nature of long-term RCTs. Although RCTs are considered as the gold-standard of research, long-duration analysis could create difficulty in managing treatment processes (Herbert et al., 2018). Another limitation of cannabis RCTs is correctly identifying recent cannabis use from urine testing methods. Urine testing results for cannabis use should be interpreted with caution as the window detection is long (up to 30 days), which means a person can test positive for up to 30 days since the last use (Hadland & Levy, 2016). One more problem associated with urine testing is that ibuprofen and other anti-inflammatories

may also be interpreted as positive for detecting cannabis on the enzyme-multiplied immunoassay technique (Center for Substance Abuse Treatment, 2006).

Limitations

There are several limitations to the current review in relation to the inclusion and exclusion criteria. The current review was restricted to the adult population, however, there have been several prominent studies, looking specifically at the psychotherapeutic treatments for adolescent cannabis use (Aguinaldo et al., 2019; Hendriks et al., 2011). Moreover, RCTs are considered as the highest standard research, however, they have their drawbacks. One drawback is that treatments proposed during a clinical trial may not account for geographical variation or may not be feasible in real-world situations, with complex clinical settings. Another drawback of RCTs is the mishandling of missing data during long-term follow-up. It is important that the absence of data should be explained in terms of the mechanism of missingness (missing completely at random, missing at random or missing not at random (M. L. Bell et al., 2013)). Data missing not at random can have serious implications in the validity of results as there may be a link between individuals' decision to dropouts and their other characteristics (M. L. Bell et al., 2013). Furthermore, despite the scrupulous systematic search, there are possibilities of missing out grey literature. It could result from a technical problem such as a problem with keywords in abstract or Mesh headings. Finally, even though the current review employed a broad inclusion criterion, to track psychotherapeutic treatments for all cannabis-related problems, the majority of the selected studies had cannabis dependence/abuse in their inclusion criteria. Therefore, the findings from the current mapping review do not provide sufficient information on what treatment would work better for a subgroup of individuals with cannabis problems and not necessarily cannabis abuse/dependence.

Conclusions

There has been an increase in the publication of psychotherapeutic treatment trials for cannabis use since the year 2000. Across the selected studies, CBT, MET, and CM treatments were most frequently tested, with modest effects. Frequency of cannabis use and abstinence were the two most commonly measured primary outcome domains across all RCTs. Additionally, self-efficacy outcomes have been increasingly studied and shown to improve abstinence by enhancing coping skill mechanisms, through treatments such as CBT and CM. In addition, the TLFB interview method was widely utilised across all RCTs to measure frequency of cannabis use and abstinence measures. Despite having some similarities amongst RCTs, there was significant heterogeneity with regards to the measurement and reporting of primary outcomes. Reporting and measuring of treatment outcomes in cannabis RCTs requires further standardisation, to allow for future meta-analytic examination to compare the magnitude of effects of existing treatments and to reduce treatment system barriers.

Chapter 4

General discussion

This chapter contains a discussion and, conclusions from the overall thesis and direction for future studies. It summarises the overall progress made through the thesis in understanding determinants of cannabis treatment-seeking and treatment efficacy.

The current thesis conceptualises determinants of treatment-seeking decisions for regular cannabis use in terms of individuals own views about their cannabis use and related behaviour as well as shortcomings of treatment system design which may also influence treatment-seeking decisions. The over-arching aim of the thesis was to identify factors contributing to disparities in treatment uptake, by examining perceived barriers and other parameters at individual level and limitations of cannabis RCTs at the treatment system level. Results from Chapter 2 showed treatment-seeking decisions seemed to be influenced primarily by individual's perception of harm concerning their use and social support. An important treatment-seeking barrier in this Chapter was identified as individuals having low confidence in treatment services. Further, in Chapter 3 it was demonstrated that psychotherapeutic treatments for cannabis are effective in reducing frequency of cannabis use. Nonetheless, limitations in selection and reporting of treatment outcomes in cannabis RCTs raises questions about the implications of their results especially in terms of reducing barriers to treatment-seeking and improving access to treatment.

There should be a recognition that results from an RCT that show treatment is effective may not match patients' expectations of treatment in the real world. In the cannabis literature, individuals' dissatisfaction with treatment services is reported as a major barrier to treatment-seeking (Pol et al., 2013), therefore, it is pertinent for RCTs to show a clear picture of how treatment success is determined in an effort to improve the desirability of and accessibility to treatment. A realist approach for evidence synthesis, which focuses on understanding the context as well as outcomes of a treatment, may provide a better understanding of mechanism of action in cannabis treatment.

Nonetheless, findings from the current thesis depict that when it comes to help-seeking for cannabis use, there are three factors that influence individuals' decisions: (a) their views of harm associated with cannabis use (b) their perception of social support they receive (c) their views of barriers to treatment-seeking. Treatment system-level barriers (such as perceived ineffectiveness of treatment) should be addressed in RCTs, along with other methodological issues to improve the quality of health resources and increase treatment uptake.

Perception of barriers to treatment-seeking

Findings from the empirical study showed that nearly half of the regular cannabis users did not prefer to seek treatment in future (Pol et al., 2013), with lack of confidence in treatment services being the most commonly reported barrier. Although lack of confidence in treatment services may stem from various factors (attitudinal or structural barriers); poor accessibility to treatment and lack of cannabis-specific treatments could contribute to disbelief in healthcare services (Pol et al., 2013). Better understanding on what causes pessimistic attitudes towards treatment requires good quality data on treatment-retention rates. Results from the mapping review showed that there was a scarcity of evidence on treatment-retention rates across all RCTs. For example, of 19 selected RCTs, six studies provided complete information on treatment-retention rates for both treatment and control groups, and only three studies reported the number of dropouts. Dropouts in RCTs are standard; however, they may have severe implications on the validity of results. Therefore, adequate information about the dropouts - how many individuals dropped out from the treatment and control group and how was missing data handled - is essential for establishing the integrity of results. For example, it may be the case that those who perceived higher levels of barrier in entering treatment were more likely to drop out from the treatment. Low rates of treatment-seeking have

shown to be correlated with high rates of treatment dropout for individuals in the mental health care (Bruwer et al., 2011). For this reason, it is essential that RCTs diagnose and report on the type of missingness that occurs in data collection and whether this missingness impacts individuals' treatment-related decisions.

Another prominent barrier to treatment-seeking, reported in empirical study, was "treatment is not tailored to my symptoms". This particular barrier has also been frequently reported in cannabis literature (Pol et al., 2013, Gates et al., 2011). It is important to note that CUD treatments are often broadly classified into two categories: cannabis-specific treatment and general SUD treatment (European Monitoring Centre for Drugs and Drug Addiction., 2015). Cannabis-specific treatment targets cannabis-related problems, whereas general substance use treatment programmes treat people with cannabis problems alongside individuals with other substance use issues. In the UK, cannabis treatment programs employ diverse approaches; however, individuals with cannabis problems are commonly offered a general substance use treatment primarily based on a Cognitive Behavioural approach (European Monitoring Centre for Drugs and Drug Addiction., 2015). As stated in cannabis treatment trials (Chapter 3), the majority of individuals who seek treatment primarily for cannabis problems do not abuse other drugs (Stephens et al., 2002). Also, a small number of individuals in this subgroup has ever received treatment for any other illicit substances (Stephens et al., 2002). These findings suggest that "treatments aimed specifically at marijuana users may be more appealing to this population than generic drug treatment services" (Stephens et al., 2002 para. 48). A better understanding of cannabis-related harm (mental health and social harm) and wider implementation of cannabis-specific treatment programs may facilitate treatment-seeking among individuals with cannabis-specific problems.

Perception of harm and treatment-seeking

Results from the empirical study showed that those who perceived cannabis as more harmful, compared to those who perceived it as less harmful, were more likely to seek treatment (than no treatment) and had higher levels of cannabis use. Importantly, due to cannabis being widely available, prevalence of diversity in use (medical or recreational), and varying levels of harm experienced by individuals with cannabis use; it is unattainable to generalise about objective treatment needs (Pol et al., 2013; Gates et al., 2012). While many individuals with problematic cannabis use remain dependent on cannabis with harmful consequences, many others with moderate or occasional use with (presumably) lower negative effects, may not require treatment and are able to recover without professional help (Lozano et al., 2006). These diverse experiences of harm from cannabis may explain the varying levels of help an individual desires to seek support. Nonetheless, this point of view assumes that individuals make choices based on their beliefs and therefore discredits the influence of non-conscious mental processes on belief and evaluations. Cognitive Bias theory (West & Brown, 2013) argues that biases in beliefs, attention and memory processes are associated with beliefs that lie at the heart of problematic substance use. For example, in many cases, although individuals would perceive negative outcomes associated with cannabis use, they would have a higher incidental recall of the positive outcomes. For this reason, individuals' perception of harm related to their cannabis use may or may not influence their cannabis use behaviours and treatment-seeking decisions.

In the empirical study, treatment-seeking was measured by three categories: informal help, formal help, and no help. While these three choices are the common health care sources for individuals with cannabis-related issues (Sherman et al., 2016); they may not be sufficient to reflect various levels of help individuals may prefer according to their experience of harm. Only a minority of

individuals with low-harm cannabis use would need to attend outpatient treatment centres, however, early prevention of problematic cannabis use could help reduce the risk of long-term dependence. Thus, the provision of help for cannabis problems should also target low-harm cannabis use and provide a spectrum of effective strategies and multiple ways of accessing services, without having to overcome unnecessary barriers. For example, a preference for self-help is commonly reported for those with less severe problems (Pol et al., 2013). As a result, computer-based help is becoming increasingly popular for managing cannabis use among individuals with varying levels of use (Tossmann et al., 2011). Lastly, it is important to note that unlike other illicit substances (for example, heroin), cannabis-related harm is more closely associated with mental health problems and societal damage as compared to acute physical damage (Nutt et al., 2007). Therefore, an open-ended questionnaire approach on treatment preferences with a wider range of treatment options (including self-help and community support therapies), may provide a better understanding of the type of help individuals are willing to seek.

Perception of social support and treatment-seeking

Findings from the empirical study showed that individuals with higher perceived social support were less likely to seek formal help and had lower levels of cannabis use. Social and contextual factors are linked with every aspect of cannabis use behaviour, from the initiation of use, treatment-seeking, to recovering from long-term dependency. In terms of treatment-seeking, the availability of social capital (through informal help) plays a crucial role in how people perceive their problems and deal with them (Berridge et al., 2018). One reason for this could be that social distance between an individual with cannabis problems and the informal help provider is less great as compared to a healthcare professional, therefore there is a feeling of acceptability, mutual understanding, and

agreement about the problems and how they can be managed. Qualitative evidence on this subject shows that the perceived approachability (meaning “easy to talk to or deal with”) element of informal help enhances individuals’ perceptions about the quality of help, in a way that they can relate to the person who is providing help (Berridge et al., 2018). Other factors such as perceived confidentiality and trustworthiness also come with informal help. These factors are particularly important to individuals who do not seek formal help for cannabis use problems as they are generally concerned about what happens to the information they disclose to healthcare professionals (Berridge et al., 2018). Qualitative studies capture experiences and perspectives of individuals with mixed, positive or negative experiences of cannabis treatment. Therefore, future studies with open-ended questions about treatment preferences and barriers may provide useful insights into individuals subjective opinions.

Although informal help is typically preferred for less harmful cannabis use, little is known about the clinical effectiveness of this kind of help in benefitting individuals with cannabis problems compared to evidence-based treatments. Evidence-based treatments for cannabis problems typically offer informal help by inviting family and friends within a wide treatment and recovery care plan (for example, Multidimensional Family Therapy).

What constitutes an effective treatment?

Results from the mapping review showed that psychotherapeutic treatments are successful in reducing the frequency of cannabis use. Several studies showed that CBT, MET, and CM treatment techniques effectively reduced the frequency of cannabis use and increased abstinence rates. These techniques use cognitive and motivational factors to target dysfunctional beliefs, feelings, sense of identity and evaluation of problematic situations. For example, treatments like CM increase

retention rates by teaching individuals healthier ways of feeling a sense of reward (for example, through vouchers) compared to what they get from cannabis use. However, regardless of the effectiveness of psychotherapeutic treatments, attempts to support individuals with cannabis problems or any SUD for that matter goes beyond fulfilling psychological needs. The ability to obtain sustained control over cannabis use activity is not the same as recovering from cannabis dependence (West & Brown, 2013). “If psychological interventions are to remain relevant and appropriately focused for each individual, they must sit within the wider treatment and recovery care planning and review processes” (*Drug Misuse and Dependence*, 2017, p. 51). Initially, treatment goals for cannabis are focused on reducing the harmful effects of cannabis, but as individuals progress through treatment, the goal shifts towards building resilience and achieving a holistic recovery (Breslin et al., 2003). Therefore, treatment should be designed keeping in mind the dynamic nature of the recovery process individuals with cannabis dependence would go through. Greater availability of community-based interventions, peer support groups and mutual aid help foster recovery and resilience; however, employment and housing issues remain areas of marked weakness (Homeless Org, 2017).

The harm reductionist approach in cannabis treatment is becoming increasingly popular (Stancliff, 2019). This approach proposes that continuing wider levels of substance use in society is unpreventable; therefore, clinical focus should be on increasing self-efficacy in reducing drug-related harm compared to complete abstinence (Leslie, 2008). For this reason, several RCTs on cannabis treatment utilise interventions such as CBT to teach self-efficacy during the treatment (Litt et al., 2013; Lozano et al., 2006). Learning coping skills to be self-reliant in minimising/quitting cannabis use and taking necessary steps to reduce harm in a high-risk situation, is the critical part of the Cognitive Behavioural interventions (Kadden & Litt, 2011).

Treatments such as Cognitive Behavioural Relapse Prevention are designed to improve self-efficacy during treatment as individuals with less self-efficacy tend to become discouraged if failed to achieve their treatment goal (Lozano et al., 2006).

Regarding treatment goals, there is an ongoing discussion if moderation, instead of total abstinence could be considered as an appropriate treatment goal for CUD (Lozano et al., 2006). The argument is based on the following points: (a) many individuals enter cannabis treatment with a lack of commitment to achieve total abstinence (b) adverse harm of cannabis is associated with heavy cannabis use rather than moderate use (c) individuals respond to treatment better if they are allowed to choose their own treatment goal as compared to what is assigned to them (social cognitive theory). While moderation as a treatment goal may work from a harm reduction approach, there are several challenges in examining this outcome; one particular challenge arises from the ambiguity of what could be considered as a 'safe' level of cannabis use. From the selected RCTs in Chapter 3, Lozano et al., (2006) measured individuals' treatment-goal preferences (moderate use or complete abstinence) associated with self-efficacy in achieving these goals. The authors concluded that differences in preference for moderation versus abstinence as a treatment goal was predicted by the extremity of problems associated with cannabis use; however, higher self-efficacy consistently fostered both goals.

Due to the nature of cannabis dependence and related harm, informal treatment is widely preferred among individuals with moderate or low levels of cannabis use in cannabis literature (Pol et al., 2013). Although informal help does not currently fit into the traditional evidence-based care system in the UK, some cannabis treatment trials, in the mapping review, had compared experimental treatment groups to a social support control group (Stephens et al., 1994; Stephens et al., 1993). From the included studies, Stephens et al., (1994) employed a Social Support control

group (support provided by group members) against a Relapse Prevention treatment group. Results revealed no significant differences between the groups in terms of days of cannabis use; however, men in the Relapse Prevention group reported less problems in reducing cannabis use than men in the Social Support group. Therefore, a gender difference analysis on the effectiveness of informal versus formal help should be considered in future studies.

As discussed in Chapter 1, preference for informal help or help which requires less face-to-face contact with the therapist has consistently been reported as a treatment facilitator in past studies (Rooke et al., 2014). For many individuals with cannabis problems, the feeling of going to a professional, or receiving an outpatient treatment service invokes the stigma of being labelled as a drug addict (Pol et al., 2013). Therefore, treatment interventions which are based on technology rather than requiring physical presence may help reduce this barrier. Nonetheless, there appears to be a scarcity of evidence on the effectiveness of web-based interventions. The current mapping review found one RCT which was delivered via computer. Authors showed that computer-based intervention had higher abstinence rates compared to therapist delivered treatment (effect size = .71).

Limitations of the Health Belief Model

The empirical study utilised constructs from the Health Belief Model to predict treatment-seeking behaviour. While variables from the model such as perceived severity and perceived barriers to treatment provided useful information, the social support variable, which is not included in HBM, also played a crucial role in examining treatment-related decisions. Consistent with previous studies, the limitation of this model in regards to the inclusion of social context may have clear implications from the public health perspective (C. J. Jones et al., 2014; Sayeed et al., 2005). Social

support in general not only facilitates informal help but also increases the chance of recovery during treatment. Nonetheless, HBM variables such as perceived benefits and self-efficacy (which were not included in the thesis) may provide an understanding of treatment retention rates in cannabis treatment trials. For example, Litt et al., (2008) study, included in the Mapping review, showed that individuals in CM treatment group had higher self-efficacy, perceived more benefits in reducing cannabis use and as a result they remained in the treatment and reduced their cannabis use.

Strengths and limitations

Limitations of the current thesis includes the following from the Empirical study: (a) recruitment of participants using non-probability sampling technique, which is not appropriate for representing the target population (b) study being underpowered due to limitations in targeting “self-identified” cannabis users, as cannabis is illegal in the UK (c) limited choice in using the tool specifically designed for cannabis (for example, barriers to treatment scale was replicated from open-ended interviews used in Pol et al., (2013)) (d) limited choice in assessing perceived harm of cannabis (for example, Nutt et al., (2010) harm perception scale was modified for cannabis only) (e) exclusion of qualitative analysis, which limited the exploration of subjective reasoning, differences in opinions and experiences (e) difficulty in advertising the study on social media platform such as Facebook, which has strict moderators for word such as “cannabis” (f) inclusion criteria for recruiting adult population within the UK, which limited the application of results for adolescent age group (g) no examination of comorbidity in the sample, as the study was exclusive to treatment-seeking decisions for cannabis-specific problems (h) lack of subgroup analysis such as gender differences, as the current study was underpowered.

Limitations of the mapping review are as follows: (a) review excluded qualitative papers; qualitative data could have been examined separately for complimentary analysis (b) selected RCTs used nomothetic treatment models, classifying participants who met diagnostic criteria of cannabis abuse/dependence. Since two people with CUD diagnosis are likely to have different personal experiences, nomothetic approach may not provide a full picture of individuals' response to treatment in real life (c) due to the nature of mapping review incorporating a broad search in a short period of time, some RCTs on this topic could be missing from the review (d) scoping exercise for the review took place between December 8th 2019 - January 16th 2020, therefore, the results do not provide recent evidences about cannabis treatment trials (g) majority of the selected RCTs did not provide information about cannabis-specific treatment manuals which is a crucial factor in bridging the gap between research and practice (f) participants in majority of selected RCTs were excluded if they had dependence on alcohol or other illegal substance.

Despite these limitations, results from the thesis as a whole suggest a range of theoretical and clinical implications. The current thesis answered the following questions: what factors affect treatment-seeking decisions for regular cannabis use? Who would and who would not seek treatment? Are psychotherapeutic treatments effective for those who would enter treatment? Understanding individuals' views about their cannabis use and related behaviour and shortcomings of treatment system design can contribute in various ways to cannabis literature. It can help professionals and policymakers: (a) predict who is less likely to seek treatment and target these groups through educational campaigns or brief advice from physicians (b) knowing about the barrier to treatment uptake and be more successful in designing an attractive treatment option, help in early prevention (c) improve treatment adherence and retention rates (d) examine if treatment

outcomes are related to treatment entry or barrier (e) match appropriate treatment with individual's goals and needs.

Participants in the empirical study had various levels of cannabis use to explain the lower rates of treatment uptake compared to the higher rates of cannabis use. The broader range of inclusion criteria, including individuals with different levels of cannabis use, shed light on the nature of cannabis consumption which is associated with varying degrees of harm and determines various levels of treatment-seeking. Findings from the thesis advocate that while cannabis use can never be considered risk-free, lower levels of use with fewer negative consequences may not warrant treatment that runs over a long time. Instead, easily accessible short interventions delivered by GP or nurses at various settings (such as a pharmacy) and through different mediums (such as computer-based treatments) should be recommended for this subgroup of people. Additionally, a higher perception of harm for mental health problems in the sample may reflect the primary risk of regular cannabis use. Thus, interventions should be designed to target mental health consequences of cannabis use (CBT is commonly used to treat the symptoms of CUD and other mental health problems).

Moreover, the Mapping Review had several utilities for researchers and policymakers. The review showed that psychotherapeutic treatments reduce the frequency of cannabis use. It provided a searchable database of cannabis RCTs (for future studies), along with intelligible descriptive information. It highlighted patterns across the literature to show the best practice and assessed knowledge gaps. An advantage of doing this review was that questions were of broader scope, which allowed the inclusion of any psychotherapeutic intervention for cannabis, delivered in different settings (outpatient, inpatient or web-based), different countries and recruited participants with various levels of cannabis use/dependence. Findings from the mapping review, in the UK

context, demonstrated a lack of evidence of cannabis treatment trials based in the UK. Additionally, the review showed that evidence is scarce for the robustness of computer-based treatment. Finally, it highlighted a lack of consistency in reporting and measuring of cannabis treatment outcomes.

Implications for future research

For cannabis treatment-seeking, future studies need to inspect the role of social support/peer influence paralleled to treatment-seeking attitudes within a closely-knit cannabis subculture. Considering the social context of cannabis use, wider availability, diversity in use and related problems; it is important to focus on the following: (a) increasing self-efficacy and self-reliance through treatment (b) providing the option for informal help for a subgroup of people who may recover without treatment, people who are not seeking treatment, and those who belong to ethnic minority groups (an average of 74.2% Caucasians were recruited across all RCTs). Unmet treatment needs (whether perceived need for care is met) for cannabis problems are prevalent among vulnerable subgroups, thus efforts should be made to address this gap. Additionally, the perspective of individuals with lived experience is an important aspect of designing treatments which are effective as well as attractive. Therefore, future cohort studies on examining individuals' recovery process would help us understand the motivation for change among different individuals with cannabis problems.

Moreover, future studies need to examine the effectiveness of computer/web-based interventions as they may facilitate treatment uptake especially for those who feel stigmatised in seeking treatment. In the context of the growing need for moderation in use rather than abstinence as the treatment goal, future studies need to identify what constitutes low harm cannabis use and if

moderate use of cannabis could be considered as an appropriate treatment goal. Furthermore, constructs from the HBM used in the study provided a strong framework in predicting treatment-seeking decisions. However, barriers to treatment construct from the model was neither associated with treatment decisions nor with the level of cannabis use. Due to individual differences in views about cannabis, experiences of harm and opinions on treatment; barriers to treatment would be better understood by qualitative evidence. However, careful consideration of the design of these studies would be needed as substance use can be stigmatised. On the other hand, social support variable, which was not included in HBM, played a superior role in predicting treatment-seeking decisions. Therefore, when using the theoretical framework of the HBM in the context of cannabis, future studies need to consider the ambiguity of the relationship between the variables and the lack of consideration of social context (for example, perceived social support). Additionally, in cannabis treatment trials, future studies should consider other relevant outcomes such as self-efficacy, level of tolerance, and harmful use. These outcomes are currently lacking in cannabis RCTs and become especially crucial to measure considering the individual differences, variation in the pattern of use and levels of harm.

Conclusions

To conclude, given the significant need to increase underutilised cannabis treatment, along with a lack of evidence concerning the effectiveness of psychotherapeutic treatments, the current thesis examined treatment-seeking variables among individuals who use cannabis regularly and mapped evidence for the clinical effectiveness of psychotherapeutic interventions. Results from the thesis showed that level of cannabis use, perception of harm and perceived social support are crucial determinants of treatment-seeking outcomes among people with regular cannabis use. The highest-

ranked barrier was having no confidence in treatment, which has been a commonly reported barrier in cannabis literature. Therefore, policymakers should focus on improving patients' perception of better care. In cannabis treatment, this could be achieved by providing non-stigmatising, cannabis-specific treatment tailored to an individuals' needs; choices of a broad variety of treatment delivered in a variety of settings (including e-health and computer-based); better communication regarding the nature of cannabis dependence and treatment success; and better user-experience aspects of entering treatment, including the accessibility and expense.

The mapping review showed evidence-based psychotherapeutic interventions have been developed over time and show promising results, however, standardisation in measuring clinically significant outcomes requires substantial and immediate consideration. The heterogeneity with which cannabis treatment outcomes are measured and reported establishes a key challenge in determining clinical effectiveness. Both abstinence rates and frequency of cannabis outcomes are considered as the indicator of clinically significant change in cannabis use. However, similar to other illegal substances (e.g., cocaine), cannabis treatment requires the establishment of consensus agreement in determining optimal outcome measures. With the growing need to improve existing cannabis treatment and developing new treatments, uniformity in measuring and reporting treatment outcomes across cannabis RCTs will allow meta-analytic examination of effectiveness of treatment and “benchmarking”, comparing the optimal outcome measures from good standard RCTs to clinical practice.

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Appendices

Appendix A. Downs and Black checklist

Appendix

Checklist for measuring study quality

Reporting

1. *Is the hypothesis/aim/objective of the study clearly described?*

yes	1
no	0

2. *Are the main outcomes to be measured clearly described in the Introduction or Methods section?*

If the main outcomes are first mentioned in the Results section, the question should be answered no.

yes	1
no	0

3. *Are the characteristics of the patients included in the study clearly described?*

In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.

yes	1
no	0

4. *Are the interventions of interest clearly described?*

Treatments and placebo (where relevant) that are to be compared should be clearly described.

yes	1
no	0

5. *Are the distributions of principal confounders in each group of subjects to be compared clearly described?*

A list of principal confounders is provided.

yes	2
partially	1
no	0

6. *Are the main findings of the study clearly described?*

Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).

yes	1
no	0

7. *Does the study provide estimates of the random variability in the data for the main outcomes?*

In non normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.

yes	1
no	0

8. *Have all important adverse events that may be a consequence of the intervention been reported?*

This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. (A list of possible adverse events is provided).

yes	1
no	0

9. *Have the characteristics of patients lost to follow-up been described?*

This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number of patients lost to follow-up.

yes	1
no	0

10. *Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?*

yes	1
no	0

External validity

All the following criteria attempt to address the representativeness of the findings of the study and whether they may be generalised to the population from which the study subjects were derived.

11. *Were the subjects asked to participate in the study representative of the entire population from which they were recruited?*

The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant

Appendix

Checklist for measuring study quality

Reporting

1. *Is the hypothesis/aim/objective of the study clearly described?*

yes	1
no	0

2. *Are the main outcomes to be measured clearly described in the Introduction or Methods section?*

If the main outcomes are first mentioned in the Results section, the question should be answered no.

yes	1
no	0

3. *Are the characteristics of the patients included in the study clearly described?*

In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.

yes	1
no	0

4. *Are the interventions of interest clearly described?*

Treatments and placebo (where relevant) that are to be compared should be clearly described.

yes	1
no	0

5. *Are the distributions of principal confounders in each group of subjects to be compared clearly described?*

A list of principal confounders is provided.

yes	2
partially	1
no	0

6. *Are the main findings of the study clearly described?*

Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).

yes	1
no	0

7. *Does the study provide estimates of the random variability in the data for the main outcomes?*

In non normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.

yes	1
no	0

8. *Have all important adverse events that may be a consequence of the intervention been reported?*

This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. (A list of possible adverse events is provided).

yes	1
no	0

9. *Have the characteristics of patients lost to follow-up been described?*

This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number of patients lost to follow-up.

yes	1
no	0

10. *Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?*

yes	1
no	0

External validity

All the following criteria attempt to address the representativeness of the findings of the study and whether they may be generalised to the population from which the study subjects were derived.

11. *Were the subjects asked to participate in the study representative of the entire population from which they were recruited?*

The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant

For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.

yes	1
no	0
unable to determine	0

Internal validity - confounding (selection bias)

21. Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?

For example, patients for all comparison groups should be selected from the same hospital. The question should be answered unable to determine for cohort and case-control studies where there is no information concerning the source of patients included in the study.

yes	1
no	0
unable to determine	0

22. Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?

For a study which does not specify the time period over which patients were recruited, the question should be answered as unable to determine.

yes	1
no	0
unable to determine	0

23. Were study subjects randomised to intervention groups?

Studies which state that subjects were randomised should be answered yes except where method of randomisation would not ensure random allocation. For example alternate allocation would score no because it is predictable.

yes	1
no	0
unable to determine	0

24. Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?

All non-randomised studies should be answered no. If assignment was concealed from patients but not from staff, it should be answered no.

yes	1
no	0
unable to determine	0

25. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?

This question should be answered no for trials if: the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders in the different treatment groups was not described; or the distribution of known confounders differed between the treatment groups but was not taken into account in the analyses. In non-randomised studies if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.

yes	1
no	0
unable to determine	0

26. Were losses of patients to follow-up taken into account?

If the numbers of patients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion lost to follow-up was too small to affect the main findings, the question should be answered yes.

yes	1
no	0
unable to determine	0

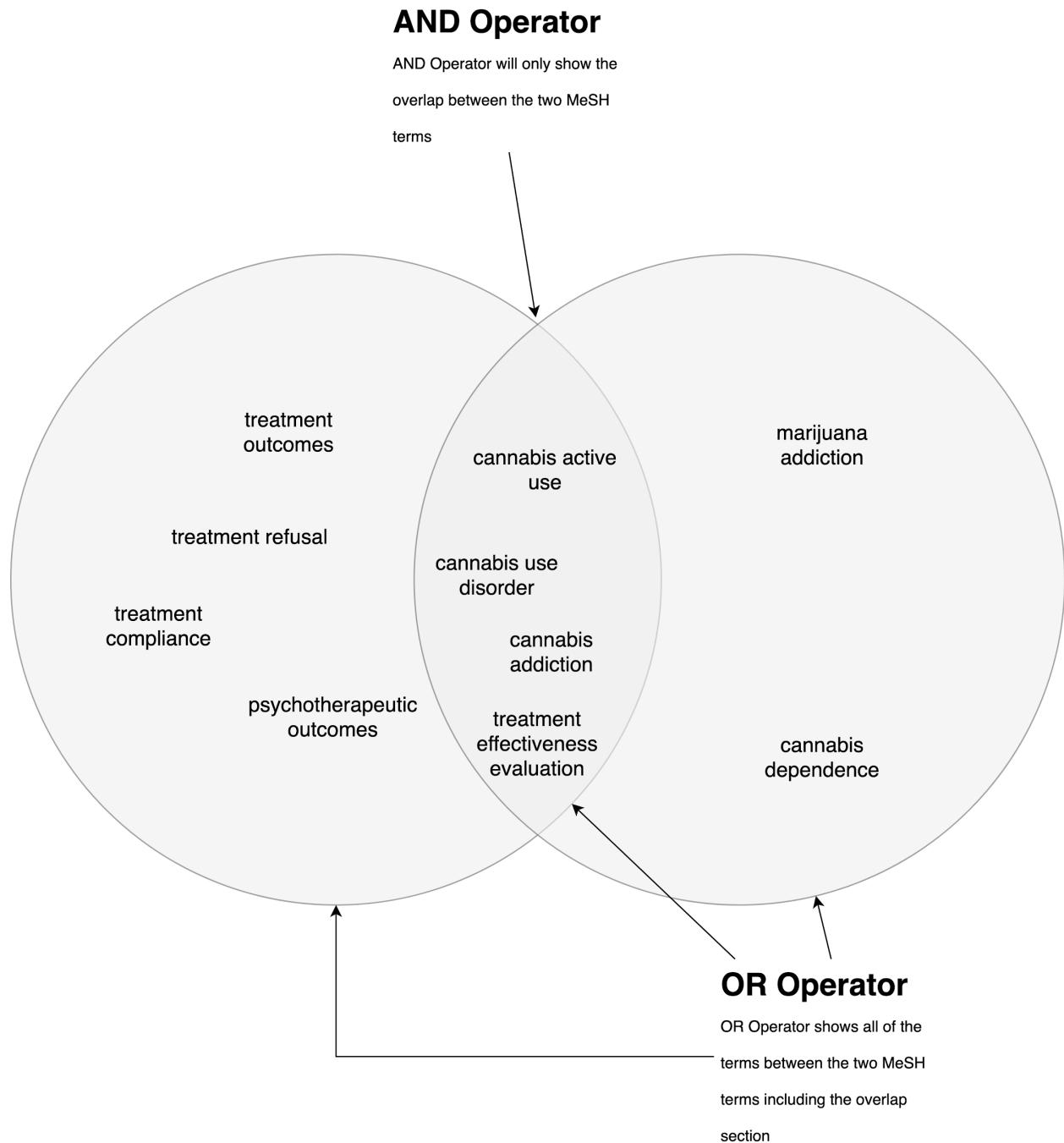
Power

27. Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?

Sample sizes have been calculated to detect a difference of x% and y%.

	Size of smallest intervention group	
A	$< n_1$	0
B	$n_1 - n_2$	1
C	$n_3 - n_4$	2
D	$n_5 - n_6$	3
E	$n_7 - n_8$	4
F	$n_9 +$	5

Appendix B. “AND & OR” boolean operators



Appendix C. Database search syntax for Ovid and Web of Science

Database (1980 - 2020)	Syntax
Medline Ovid search interface	"cannabis use disorder"/ or "marijuana addiction"/ or "cannabis addiction"/ or "cannabis active use"/ or "cannabis dependence".mp. and treatment outcomes/ or psychotherapeutic outcomes/ or treatment compliance/ or treatment duration/ or treatment refusal/ or treatment termination/ or treatment withholding/ or therapeutic processes/ or treatment effectiveness evaluation/ or Cognitive Behavior Therapy/ or Mindfulness-Based Interventions/ or Treatment Effectiveness Evaluation/ or Psychotherapy/ or Cognitive Therapy/
Embase Ovid search interface	"cannabis use disorder"/ or "marijuana addiction"/ or "cannabis addiction"/ or "cannabis active use"/ or "cannabis dependence".mp. and treatment outcomes/ or psychotherapeutic outcomes/ or treatment compliance/ or treatment duration/ or treatment refusal/ or treatment termination/ or treatment withholding/ or therapeutic processes/ or treatment effectiveness evaluation/ or Cognitive Behavior Therapy/ or Mindfulness-Based Interventions/ or Treatment Effectiveness Evaluation/ or Psychotherapy/ or Cognitive Therapy/
PsycINFO Ovid search interface	"cannabis use disorder"/ or "marijuana addiction"/ or "cannabis addiction"/ or "cannabis active use"/ or "cannabis dependence".mp. and treatment outcomes/ or psychotherapeutic outcomes/ or treatment compliance/ or treatment duration/ or treatment refusal/ or

	treatment termination/ or treatment withholding/ or therapeutic processes/ or treatment effectiveness evaluation/ or Cognitive Behavior Therapy/ or Mindfulness-Based Interventions/ or Treatment Effectiveness Evaluation/ or Psychotherapy/ or Cognitive Therapy/
Web of Science	
Web of science search interface	TI=cannabis use disorder or TI=marijuana addiction or TI=cannabis addiction or TI=cannabis active use AND TI=treatment outcomes or TI=psychotherapeutic outcomes or TI=treatment compliance or TI=treatment duration or TI=treatment refusal or TI=treatment termination or TI=treatment withholding or TI=therapeutic processes or TI=treatment effectiveness evaluation or TI=Cognitive Behavior Therapy or TI=Mindfulness-Based Interventions or TI=Treatment Effectiveness Evaluation or TI=Psychotherapy or TI=Cognitive Therapy
BIOSIS	
Web of science search interface	TI=cannabis use disorder or TI=marijuana addiction or TI=cannabis addiction or TI=cannabis active use AND TI=treatment outcomes or TI=psychotherapeutic outcomes or TI=treatment compliance or TI=treatment duration or TI=treatment refusal or TI=treatment termination or TI=treatment withholding or TI=therapeutic processes or TI=treatment effectiveness evaluation or TI=Cognitive Behavior Therapy or TI=Mindfulness-Based Interventions or TI=Treatment Effectiveness Evaluation or TI=Psychotherapy or TI=Cognitive Therapy

Appendix D. Study Questionnaire

- 1 By clicking the Yes button below I indicate that I understand what the study involves, I agree to take part and I am answering Yes to all of the above questions. If I do not want to participate I can close this window/press the No button.

Option	Count
Yes	0
No	0

-
- 2 Are you 18 or older?

Option	Count
Yes	0
No	0

-
- 3 Do you currently live in the United Kingdom?

Option	Count
Yes	0
No	0

-
- 4 Have you used cannabis (can include smoking, vaping or eating) in the last 3 months?

Option	Count
Yes	0
No	0

5 Age

No responses

6 Gender

Option	Count
Male	0
Female	0
Prefer to self-identify	0
Prefer not to say	0

6.a If you selected "Prefer to self-identify", please specify:

No responses

7 County

Option	Count
Bedfordshire	0
Berkshire	0
Bristol	0
Buckinghamshire	0
Cambridgeshire	0
Cheshire	0
Cornwall	0
County Durham	0
Cumbria	0
Derbyshire	0
Devon	0
Dorset	0
East Riding of Yorkshire	0
East Sussex	0
Essex	0
Gloucestershire	0

Greater London	0
Greater Manchester	0
Hampshire	0
Herefordshire	0
Hertfordshire	0
Isle of Wight	0
Isles of Scilly	0
Kent	0
Lancashire	0
Leicestershire	0
Lincolnshire	0
Merseyside	0
Norfolk	0
North Somerset	0
North Yorkshire	0
Northamptonshire	0
Northumberland	0
Nottinghamshire	0
Oxfordshire	0
Rutland	0
Shropshire	0
Somerset	0
South Gloucestershire	0
South Yorkshire	0
Staffordshire	0
Suffolk	0
Surrey	0
Tyne & Wear	0
Warwickshire	0
West Midlands	0
West Sussex	0
West Yorkshire	0
Wiltshire	0

Worcestershire	0
Aberdeenshire	0
Angus	0
Argyll & Bute	0
Ayrshire	0
Banffshire	0
Berwickshire	0
Borders	0
Caithness	0
Clackmannanshire	0
Dumfries & Galloway	0
Dunbartonshire	0
East Ayrshire	0
East Dunbartonshire	0
East Lothian	0
East Renfrewshire	0
Fife	0
Highland	0
Inverclyde	0
Kincardineshire	0
Lanarkshire	0
Midlothian	0
Moray	0
North Ayrshire	0
North Lanarkshire	0
Orkney	0
Perth & Kinross	0
Renfrewshire	0
Shetland	0
South Ayrshire	0
South Lanarkshire	0
Stirlingshire	0
West Dunbartonshire	0

West Lothian	0
Western Isles	0
Blaenau Gwent	0
Bridgend	0
Caerphilly	0
Cardiff	0
Carmarthenshire	0
Ceredigion	0
Conwy	0
Denbighshire	0
Flintshire	0
Gwynedd	0
Isle of Anglesey	0
Merthyr Tydfil	0
Monmouthshire	0
Neath Port Talbot	0
Newport	0
Pembrokeshire	0
Powys	0
Rhondda Cynon Taff	0
Swansea	0
Torfaen	0
Vale of Glamorgan	0
Wrexham	0
Antrim	0
Armagh	0
Down	0
Fermanagh	0
Londonderry	0
Tyrone	0

8 What is the highest level of education you have completed or the highest degree you have

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received?

Option	Count
GCSE / O Level	0
Higher / NVQ / SVQ	0
National Diploma	0
University degree	0
Post graduate degree	0
Doctoral degree	0

9 What is your current employment status?

Option	Count
Employed for wages	0
Self-employed	0
Out of work but looking	0
Out of work but not looking	0
Homemaker	0
Student	0
Military	0
Retired	0
Unable to work	0

10 Who do you live with at the moment? (please think of who you live with most of the time and tick all that apply)

Option	Count
No one	0
Friends	0
House/Flat mate I didn't know at the time of tenancy agreement	0
Partner or boy/girlfriend	0
My own child(ren)	0
Mother	0
Father	0
Step-mother/father's partner	0
Step-father/mother's partner	0
Brother/sister(s) (incl. adopted)	0
Step-brother/sister(s)	0
Brother/sister(s)-in-law	0
Grandparent(s)	0
Other relative(s)	0
Other non-relative(s)	0

11 How often do you use cannabis?

Option	Count
Never	0
Monthly or less	0
2 to 4 times a month	0
2 to 3 times a week	0
4 or more times a week	0

12 How many hours were you "stoned" on a typical day when you had been using cannabis

Option	Count
Less than 1	0
1 or 2	0
3 or 4	0
5 or 6	0
7 or more	0

-
- 13** How often during the past 6 months did you find that you were not able to stop using cannabis once you had started?

Option	Count
Never	0
Less than monthly	0
Monthly	0
Weekly	0
Daily or almost daily	0

-
- 14** How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis?

Option	Count
Never	0
Less than monthly	0
Monthly	0
Weekly	0
Daily or almost daily	0

-
- 15** How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis?

Option	Count
Never	0
Less than monthly	0
Monthly	0
Weekly	0
Daily or almost daily	0

-
- 16** How often in the past 6 months have you had a problem with your memory or concentration after using cannabis?

Option	Count
Never	0
Less than monthly	0
Monthly	0
Weekly	0
Daily or almost daily	0

-
- 17** How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children:

Option	Count
Never	0
Less than monthly	0
Monthly	0
Weekly	0
Daily or almost daily	0

-
- 18** Have you ever thought about cutting down, or stopping, your use of cannabis?

Option	Count
Never	0
Yes, but not in the last 6 months	0
Yes, during the past 6 months	0

19 Did you ever think your use of cannabis was out of control?

Option	Count
Never or almost never	0
Sometimes	0
Often	0
Always or nearly always	0

20 Did the prospect of missing a smoke make you very anxious or worried?

Option	Count
Never or almost never	0
Sometimes	0
Often	0
Always or nearly always	0

21 Did you worry about your use of cannabis?

Option	Count
Not at all	0
A little	0
Quite a lot	0
A great deal	0

22 Did you wish you could stop?

Option	Count
Never or almost never	0
Sometimes	0
Often	0
Always or nearly always	0

23 How difficult would you find it to stop or go without?

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Option	Count
Not difficult	0
Quite difficult	0
Very difficult	0
Impossible	0

24 About your support network

24.1 There is a special person who is around when I am in need

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.2 There is a special person with whom I can share my joys and sorrows

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.3 My family really tries to help me

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.4 I get the emotional help and support I need from my family

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.5 I have a special person who is a real source of comfort to me

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.6 My friends really try to help me

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.7 I can count on my friends when things go wrong

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.8 I can talk about my problems with my family

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.9 I have friends with whom I can share my joys and sorrows

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.10 There is a special person in my life who cares about my feelings

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.11 My family is willing to help me make decisions

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

24.12 I can talk about my problems with my friends

Option	Count
Very Strongly disagree	0
Strongly disagree	0
Mildly disagree	0
Neutral	0
Mildly agree	0
Strongly agree	0
Very Strongly agree	0

25 My views on the risks of cannabis

25.1 What is the risk that taking an overdose of cannabis will be fatal?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

25.2 What is the risk of cannabis causing the user's death other than by overdose?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

25.3 What is the risk that use of cannabis will cause direct damage to the physical health of the user?
For example, suffering from a chronic illness due to the drug use.

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.4 What is the risk that the use of cannabis will result in unintentional damage to the user's physical health? For example an injury due to the use of cannabis or losing self-control whilst under the influence of the drug

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.5 What is the risk of becoming addicted to cannabis?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.6 What is the risk that using cannabis will cause the user to have mental health problems?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.7 What is the risk that the use of cannabis may result in problems in the users social/work life which can then lead them to have mental health problems.

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.8 What is the risk that the use of cannabis will result in the loss of material possessions and status for the user e.g. loss of income, housing, job?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.9 What is the risk that the use of cannabis will result in loss of relationships with family and friends in the user?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.10 What is the risk that the use of cannabis will result in injuries to other people?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

-
- 25.11 What is the risk that the use of cannabis will lead to an increase in criminal behaviour in the

community to fund the users' habits?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

25.12 What is the risk that the use of cannabis will cause damage to the local environment?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

25.13 What is the risk that the use of cannabis will cause problems in the user's family?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

25.14 What is the risk that the use of cannabis in this country will result in economic, social or environmental problems in other countries where cannabis is produced?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

25.15 What is the risk that use of cannabis will have a negative impact on the economy of this country

as a whole for example through increased health care costs to the drug user, loss of productivity and absenteeism at work?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

25.16 What is the risk that the use of cannabis will result in the decline of happiness and quality of life in the community as a whole?

Option	Count
No risk	0
Some risk	0
Moderate risk	0
Extreme risk	0

26 Have you ever sought help for cannabis-related problems?

Option	Count
Yes - I have sought informal help	0
Yes - I have sought formal help	0
No - I have not sought help	0

27 If no, Would you consider seeking treatment in the future?

Option	Count
Yes - Informal help only	0
Yes - Formal help	0
No	0

28 Sometimes people don't seek help because there are things standing in their way, known as 'barriers'. Please read the following statements carefully and mark in the box how much you believe each barrier to treatment would affect whether or not you sought treatment for cannabis use.

28.1 I think treatment is ineffective

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.2 I want to avoid stigma attached with seeking treatment

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.3 I think treatment is not for me

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.4 I think treatment is the last resort

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.5 I think treatment is not tailored to my symptoms

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.6 I think treatment is only for severe cases

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.7 I think my problem would resolve spontaneously

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.8 I have already received help from another health professional

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.9 I think nobody could help me

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.10 I don't have time for treatment

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.11 I have no confidence in treatment services

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.12 I have problems that resolved themselves without treatment

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.13 I am worried about family/friends' opinion

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

28.14 I am unaware of treatment options

Option	Count
Strongly disagree	0
Disagree	0
Unsure	0
Agree	0
Strongly agree	0

Appendix E. Participant information sheet



School of Medicine
University of Nottingham
Medical School
Nottingham
NG7 2UH

ONLINE PARTICIPANT INFORMATION

STUDENT RESEARCH PROJECT ETHICS REVIEW Division of Psychiatry & Applied Psychology

Project Title: Exploring why people do and do not seek treatment for cannabis: A survey of UK-based regular cannabis users.

Researcher/Student: Snehil Tripathi (Snehil.Tripathi@nottingham.ac.uk).

Supervisor/Chief Investigator: Dr Katy Jones (katy.jones@nottingham.ac.uk) and Dr Shihning Chou (shihning.chou@nottingham.ac.uk).

Ethics Reference Number: to be added after approval

We would like to invite you to take part in a research study about. Before you begin, we would like you to understand why the research is being done and what it involves for you.

What is the purpose of this study?

The study aims to investigate if people who regularly use cannabis have ever sought treatment for their cannabis use, or why they may or may not seek treatment. The main aim of the study is to gain an academic qualification in Clinical Psychology. However, we hope findings would help cannabis users seeking treatment and health care professionals in the future.

Why have I been invited?

We wish to recruit people living in the UK who are aged between 18-55 and are currently using cannabis. We have advertised this study through Facebook targeted ads (based on age, your current location, UK), Reddit (based on age and the current location) and through the Institute of Mental Health on Twitter. You have clicked on this link because you may have an interest in, or have had an experience of cannabis.

Do I have to take part?

No. It is up to you to decide whether or not you want to take part in this study. If you decide to complete the online survey you are consenting to take part in this phase of the research. The information you share with us in the online survey will be confidential and anonymous. The data will only be used in this research project. You may change your mind about being involved at any time by clicking out of the survey without giving a reason

What will I be asked to do?

If you still wish to take part in the survey, you can click the 'next' button on the survey which will take you to a consent form. By consenting to the study you are telling us that you understand what the study involves and agree to take part. If you do not want to participate you can close this window now or press the exit button. The online survey will take approximately 25 minutes to complete. We will ask you to provide:

Version – 1 June 2018



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- Brief demographic information about you (age, gender, education level, where in the UK you currently live (county only), who you live with and if you are employed).
- Your current use of cannabis (e.g., how much and how often) and some questions about your ideas of the risks of cannabis use and dependence.
- Your current social support (for example, how much contact you have with close others such as friends or family).
- Your engagement with formal or informal help for cannabis use (if any). Your attitudes towards seeking help for cannabis use.

Are there any possible disadvantages or risks in taking part?

You will be asked to disclose information about your current use of cannabis, and any harm you might have experienced as a result of your use of cannabis. This can be challenging if you or others are currently experiencing difficulties. If you decide to participate you will be provided with some links about seeking help for cannabis use if you need them. We've also put them at the bottom of this information sheet if you wanted to access them but not take part in the study. There can also be fear to identify with a cannabis-using group from the threat of stigma attached to it or the legal aspect of cannabis. Therefore, we will do everything we can to ensure that your identity will remain confidential. A possible disadvantage to the study is that this study focuses on treatment for cannabis, so it is not an appropriate platform to express general opinions about using cannabis.

What will happen to the information I provide?

Everything you report is confidential and will only be used by the researchers of this study. It will not be possible to identify you from our research report or any other dissemination activities. The connection to the survey will be end to end encrypted using https protocol, meaning all data transferred during this process will be secured. However, we are unable to disable the Facebook tracking cookies upon click-through of the ad. If this is a privacy concern, we suggest you disable cookies, or use an adblocker to mitigate the cookie. For more information please refer to the following link https://en-gb.facebook.com/full_data_use_policy.

The survey storage is GDPR compliant as information will be hosted on the university site. Since this is an online survey, once you have completed and submitted an anonymous questionnaire it is not possible to withdraw the data because we won't know who you are. If you are interested in being sent a general summary of research findings you can contact us on the e-mail addresses provided at the top of this information sheet. However, please be aware that this will be a very short anonymised summary of all findings and we will not be able to provide you with your specific results.

What if there is a problem?

If you have any queries or complaints, please contact the student's supervisor/chief investigator in the first instance. If this does not resolve your query, please write to the Administrator to the



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Division of Psychiatry & Applied Psychology's Research Ethics Sub-Committee
adrian.pantry1@nottingham.ac.uk who will pass your query to the Chair of the Committee.

We believe there are no known risks associated with this research study; however, as with any online activity the risk of a breach is always possible. We will do everything possible to ensure your answers in this study will remain anonymous.

For more information about cannabis and getting help (UK specific):

<https://www.talktofrank.com/drug/cannabis>

<https://www.ukat.co.uk/drugs/cannabis/>

<https://www.nhs.uk/live-well/healthy-body/drug-addiction-getting-help/#>

If you or someone you know urgently feels at risk then please contact NHS 111 or you can call Samaritans on 116 123 for free.

Appendix F. Consent form



School of Medicine
University of Nottingham
Medical School
Nottingham
NG7 2UH

ONLINE PARTICIPANT CONSENT

STUDENT RESEARCH PROJECT ETHICS REVIEW Division of Psychiatry & Applied Psychology

Project Title: Exploring why people do and do not seek treatment for cannabis: A survey of UK-based regular cannabis users.

Researcher: Snehil Tripathi, Snehil.Tripathi@nottingham.ac.uk

Supervisors: Dr Katy Jones (katy.jones@nottingham.ac.uk) and Dr Shihning Chou (shihning.chou@nottingham.ac.uk).

Ethics Reference Number: To be added once approved.

- Have you read and understood the Participant Information? YES/NO
 - Do you agree to participate in a survey about non-treatment seeking among cannabis users? YES/NO
 - Do you know how to contact the researcher if you have questions about this study? YES/NO
 - Do you understand that you are free to withdraw from the study without giving a reason? YES/NO
 - Do you understand that for anonymous questionnaire studies, once you have completed the study and submitted your answers, the data cannot be withdrawn? YES/NO
 - Do you give permission for your data from this study to be shared with other researchers in the future provided that your anonymity is protected? YES/NO
 - Do you understand that non-identifiable data from this study including quotations might be used in academic research reports or publications? YES/NO
 - I confirm that I am 18 years old or over YES/NO
-

By clicking the button below I indicate that I understand what the study involves and I agree to take part. If I do not want to participate I can close this window/press the exit button.

Appendix G. Empirical study advertisement

The advertisement features a background of green cannabis leaves. Overlaid on this background is white text. The text is arranged in two main sections, each with a line break. The first section asks if the viewer wants to take part in a study about cannabis. The second section instructs the viewer to click a link below for more information.

**Do you want to take
part in a study about
cannabis?**

**Click the link below
for more information**

Appendix H. Downs & Black Checklist

Appendix 12 (as supplied by the authors): Modified Downs and Black checklist for the assessment of the methodological quality of both randomized and non-randomized studies¹

Item	Criteria	Possible Answers
Reporting		
1	<i>Is the hypothesis/aim/objective of the study clearly described?</i>	Yes = 1 No = 0
2	<i>Are the main outcomes to be measured clearly described in the Introduction or Methods section?</i> If the main outcomes are first mentioned in the Results section, the question should be answered no.	Yes = 1 No = 0
3	<i>Are the characteristics of the patients included in the study clearly described?</i> In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.	Yes = 1 No = 0
4	<i>Are the interventions of interest clearly described?</i> Treatments and placebo (where relevant) that are to be compared should be clearly described.	Yes = 1 No = 0
5	<i>Are the distributions of principal confounders in each group of subjects to be compared clearly described?</i> A list of principal confounders is provided.	Yes = 2 Partially = 1 No = 0
6	<i>Are the main findings of the study clearly described?</i> Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).	Yes = 1 No = 0
7	<i>Does the study provide estimates of the random variability in the data for the main outcomes?</i> In non-normally distributed data the interquartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.	Yes = 1 No = 0
8	<i>Have all important adverse events that may be a consequence of the intervention been reported?</i> This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. (A list of possible adverse events is provided).	Yes = 1 No = 0
9	<i>Have the characteristics of patients lost to follow-up been described?</i> This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number of patients lost to follow-up.	Yes = 1 No = 0
10	<i>Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?</i>	Yes = 1 No = 0
External validity		
11	<i>Were the subjects asked to participate in the study representative of the entire population from which they were recruited?</i> The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant population exists. Where a study does not report the proportion of the source population from which the patients are derived, the question should be answered as unable to determine.	Yes = 1 No = 0 Unable to determine = 0

Appendix to: Trac MH, McArthur E, Jandoc R, et al. Macrolide antibiotics and the risk of ventricular arrhythmia in older adults. CMAJ 2016. DOI:10.1503/cmaj.150901. Copyright © 2016 8872147 Canada Inc. or its licensors

12	<i>Were those subjects who were prepared to participate representative of the entire population from which they were recruited?</i> The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population.	Yes = 1 No = 0 Unable to determine = 0
13	<i>Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?</i> For the question to be answered yes the study should demonstrate that the intervention was representative of that in use in the source population. The question should be answered no if, for example, the intervention was undertaken in a specialist centre unrepresentative of the hospitals most of the source population would attend.	Yes = 1 No = 0 Unable to determine = 0
Internal validity - bias		
14	<i>Was an attempt made to blind study subjects to the intervention they have received?</i> For studies where the patients would have no way of knowing which intervention they received, this should be answered yes.	Yes = 1 No = 0 Unable to determine = 0
15	<i>Was an attempt made to blind those measuring the main outcomes of the intervention?</i>	Yes = 1 No = 0 Unable to determine = 0
16	<i>If any of the results of the study were based on "data dredging", was this made clear?</i> Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.	Yes = 1 No = 0 Unable to determine = 0
17	<i>In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls?</i> Where follow-up was the same for all study patients the answer should be yes. If different lengths of follow-up were adjusted for by, for example, survival analysis the answer should be yes. Studies where differences in follow-up are ignored should be answered no.	Yes = 1 No = 0 Unable to determine = 0
18	<i>Were the statistical tests used to assess the main outcomes appropriate?</i> The statistical techniques used must be appropriate to the data. For example nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described it must be assumed that the estimates used were appropriate and the question should be answered yes.	Yes = 1 No = 0 Unable to determine = 0
19	<i>Was compliance with the intervention/s reliable?</i> Where there was non-compliance with the allocated treatment or where there was contamination of one group, the question should be answered no. For studies where the effect of any misclassification was likely to bias any association to the null, the question should be answered yes.	Yes = 1 No = 0 Unable to determine = 0
20	<i>Were the main outcome measures used accurate (valid and reliable)?</i> For studies where the outcome measures are clearly described, the question should be answered yes. For studies which refer to other work or that demonstrates the outcome measures are accurate, the question should be answered as yes.	Yes = 1 No = 0 Unable to determine = 0
Internal validity - confounding (selection bias)		
21	<i>Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?</i> For example, patients for all comparison groups should be selected from the same hospital. The question should be answered unable to determine for cohort and case-control studies where there is no information	Yes = 1 No = 0 Unable to determine = 0

Appendix to: Trac MH, McArthur E, Jandoc R, et al. Macrolide antibiotics and the risk of ventricular arrhythmia in older adults. CMAJ 2016. DOI:10.1503/cmaj.150901. Copyright © 2016 8872147 Canada Inc. or its licensors

	concerning the source of patients included in the study.	
22	<i>Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?</i> For a study which does not specify the time period over which patients were recruited, the question should be answered as unable to determine.	Yes = 1 No = 0 Unable to determine = 0
23	<i>Were study subjects randomized to intervention groups?</i> Studies which state that subjects were randomized should be answered yes except where method of randomization would not ensure random allocation. For example alternate allocation would score no because it is predictable.	Yes = 1 No = 0 Unable to determine = 0
24	<i>Was the randomized intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?</i> All non-randomized studies should be answered no. If assignment was concealed from patients but not from staff, it should be answered no.	Yes = 1 No = 0 Unable to determine = 0
25	<i>Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?</i> This question should be answered no for trials if: the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders in the different treatment groups was not described; or the distribution of known confounders differed between the treatment groups but was not taken into account in the analyses. In non-randomized studies if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.	Yes = 1 No = 0 Unable to determine = 0
26	<i>Were losses of patients to follow-up taken into account?</i> If the numbers of patients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion lost to follow-up was too small to affect the main findings, the question should be answered yes.	Yes = 1 No = 0 Unable to determine = 0
Power		
27*	<i>Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?</i> Sample sizes have been calculated to detect a difference of x% and y%.	Yes = 1 No = 0 Unable to determine = 0

*Item has been modified.

Reference

- Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health* 1998;52:377-84.