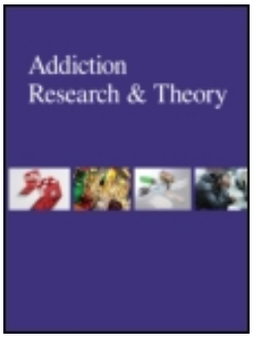

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Psychological and psychosocial interventions for cannabis cessation in adults: A systematic review

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ABSTRACT

Objective: Many psychological and psychosocial interventions have been developed to treat regular users of cannabis, but it is unclear which intervention(s) are the most effective. This article aims to assess the effectiveness of psychological and psychosocial interventions for cannabis cessation, and to outline priorities for future research. *Methods*: A systematic review of the scientific literature. Eleven databases were searched in February 2014. *Results*: Twenty-six RCTs were identified; the majority were considered to be at a high risk of bias. Cognitive behavioural therapy (CBT) significantly improved outcomes compared with wait-list in five studies post-treatment, maintained at 9 months in the one study with later follow-up. Studies of motivational interviewing (MI) or motivational enhancement therapy (MET) gave mixed results, with some improvements over wait-list while some comparisons were not significant. Four studies comparing CBT against MI/MET gave mixed results; longer courses of CBT provided some improvements over shorter MI. Courses of other types of therapy (social support groups and case management) gave similar improvements to CBT. Vouchers for abstinence (contingency management) gave promising results in the short-term and at follow-up. *Conclusion*: Studies were heterogeneous, covering a range of interventions, comparators, populations and outcomes. CBT improved short-term outcomes in a clinically dependent self-selected population of cannabis users. Brief MI improved short-term outcomes at post-treatment in a younger non-clinically dependent population. There is some evidence that CBT may be more effective than briefer MI interventions although results were mixed. Contingency management may enhance long-term outcomes in combination with CBT in clinically dependent individuals.

KEYWORDS
Cannabis cessation, cannabis dependence, psychological interventions, psychosocial interventions, substance abuse, systematic review

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Introduction

Cannabis is the most commonly used illicit drug worldwide (UNODC, 2013). The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) annual report notes that cannabis is the illicit drug most likely to be used across Europe, with 11.2% of 15–34 year olds reporting use in the last year (European Monitoring Centre for Drugs and Drug Addiction, 2014). Routine data collected by the US government shows that there were a total of 300,000 admissions for cannabis use in 2012, making up 17.5% of admissions for substance abuse in the US for that year (U.S Department of Health and Human Services, 2014).

Not all cannabis use is problematic, but harm is most likely in weekly and daily users (Davis, Thomas, Jesseman, & Mazan, 2009). Cannabis dependence, defined by the International Classification of Disorders (ICD-10) as "a cluster of physiological, behavioural, and cognitive phenomena in which the use of cannabis takes on a much higher priority for a given individual than other behaviours that once had greater value" can develop from frequent use (World Health Organization, 2000). Not all individuals who use cannabis frequently develop dependence; it is not clear why some individuals develop dependence while others do not (van der Pol et al., 2013). The quantity of cannabis consumed per day and the level of harm sustained should be taken into account when ascertaining if an individual is dependent, and not just frequency of use (Asbridge, Duff, Marsh, & Erickson, 2014). Different interventions may be applicable depending on whether or not an individual is at risk of dependence; screening tools, such as The Alcohol, Smoking and Substance Involvement Screening Test

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(ASSIST), recommend that those at moderate risk receive a "brief intervention", while those at high risk receive an "intensive intervention" (WHO ASSIST Working Group, 2002).

Psychosocial and psychological interventions are used in clinical practice to treat individuals who regularly use cannabis (National Institute for Health and Care Excellence (NICE), 2007). Interventions, such as Cognitive Behavioural Therapy (CBT), motivational interviewing (MI) and contingency management, aim to change an individual's behaviour through either changing the way the individual thinks or behaves (CBT), improving motivation to change and resolving ambivalence to change (MI) or providing individuals with tangible rewards (such as monetary vouchers) to reinforce behaviour change (contingency management).

A number of systematic reviews have been undertaken to assess the benefits of psychological and psychosocial interventions for regular cannabis users (Davis et al., 2015; Denis, Lavie, Fatseas, & Auriacombe, 2006; Dutra et al., 2008). All have found some positive effects of such interventions on cannabis users, but have only included a subset of the available evidence, for example, only including RCTs with non-active control conditions (Davis et al., 2015), non-intensive treatments (Dutra et al., 2008) or only individuals meeting the diagnostic criteria for cannabis dependence (Denis et al., 2006; Dutra et al., 2008).

Box 1. Electronic databases

- MEDLINE
- EMBASE
- Cochrane Controlled Trials Register (CCTR)
- Health Technology Assessment (HTA) database
- Database of Abstracts of Reviews of Effects (DARE)
- Cochrane Systematic Reviews Database (CDSR)
- NHS Economic Evaluation Database (NHS EED)
- PsycInfo
- Web of Science Conference Proceedings Citation Index (WoS CPCI-S, WoS CPCP-SSH)
- ClinicalTrials.gov
- metaRegister of Controlled Trials (mRCT)

The aim of this review is to assess the evidence for the effectiveness of a broad range of psychosocial and psychological interventions for cannabis cessation in adults.

Methods

Literature search and inclusion criteria

In February 2014, searches of electronic databases (listed in Box 1) were undertaken. Search terms are available on request. Additional search methods included checking references within relevant reviews and studies (reference tracking) and contact with experts. Inclusion and exclusion criteria are listed in Box 2.

Data extraction and quality assessment

Titles and abstracts were screened by one reviewer and a 10% sample checked by a second reviewer. Full texts were screened by two reviewers. Data extraction was undertaken by one reviewer and checked by a second reviewer; any disagreements were resolved through discussion. Where studies comprised duplicate reports, the most recent and relevant report was used as the main source.

Two reviewers independently assessed the methodological quality of each study and discrepancies were resolved through discussion. Quality was assessed using an adapted version of the Cochrane Collaboration risk of bias assessment criteria. Two adaptations were made to these criteria. Firstly, the "5-and-20 rule" was utilised for incomplete outcome data – a level of risk was allocated to participant attrition, either being low risk (<5% attrition), intermediate risk (5–20%) or high risk (>20%) (Schulz & Grimes, 2002). Attrition at the final follow-up was used to assign a level of risk in studies with multiple follow-up points. The second adaptation was to add an "overall risk" criterion, where studies were categorised using the following criteria: "Low-risk" was allocated to studies where randomisation, allocation concealment,

Box 2. Inclusion exclusion criteria

Inclusion criteria	Exclusion criteria
(1) RCT design	(1) Based within the criminal justice setting (e.g. parole or prison)
(2) Included, in the majority (i.e. over 50%), adults aged 18 years or over who were users of cannabis	(2) Involved providing interventions to an individual other than the regular cannabis user (e.g. partner or parent)
(3) Tested a psychological or psychosocial intervention against comparator(s) (excluding pharmacological comparators)	(3) Undertaken within a sub-specific population (i.e. indigenous communities or HIV positive individuals)
(4) Provided data relating to individuals' cannabis usage (where studies involved participants with multiple drug dependencies, studies were included if they reported cannabis use outcomes for the cannabis using population)	(4) Aimed to treat the participant's psychological condition rather than their cannabis use in "dually diagnosed" patients (i.e. patients with both a psychiatric condition and cannabis dependence)
(5) Published in a peer-reviewed journal	(5) Delivered the intervention, or a component of the intervention, within an inpatient setting (i.e. study participants are resident within a ward or treatment facility)
	(6) Written in languages other than English

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blinded outcome assessment and incomplete data were all determined to be "low risk". "High-risk" was allocated to studies deemed to have undertaken inadequate randomisation (e.g. self-selection, sequential patients), and/or where allocation was not concealed, and/or where incomplete data was deemed to be "high risk". "Unclear risk" was allocated to all other studies. These criteria were added to reduce the subjectivity of the Cochrane tool, in order to increase the reliability of the tool when used by two researchers, and to provide an overall picture of the risk of bias for each study.

Data synthesis

Data were analysed via a narrative synthesis, based around grouping and tabulating the data in meaningful clusters, allowing results to be summarised to provide an overview of the direction of effect for each relevant subgroup (Popay et al., 2006). Studies were categorised according to their intervention and comparison groups (e.g. CBT versus wait-list, CBT versus MI, etc.). Results were tabulated for two key time points (post-treatment and latest follow-up). The latest follow-up time point was selected as the majority of trials did not utilise the same follow-up time points; selecting the latest follow-up provided information regarding the long-term effect of the interventions. Effect sizes and corresponding confidence intervals were included in the synthesis when reported by the studies. Where reported, Cohen's *D* effect sizes were classified as small (threshold of $d = 0.20$), medium ($d = 0.50$), large ($d = 0.80$), or very large ($d = 1.30$) using the thresholds as described by Rosnow and Rosenthal (1996). In order to synthesise the data, key outcomes were selected which were both clinically relevant and reported by the majority of studies.

Results

The searches identified 1087 citations. In total, 33 articles relating to 25 RCTs were included in this review. The full PRISMA flow chart is shown in Figure 1.

Description of studies contributing to data synthesis

Table 1 gives an overview of the characteristics of the included studies. Studies were undertaken in a range of countries and recruited a total of 7938 participants.

Interventions varied considerably; single interventions consisted of multiple and overlapping components. Ten studies assessed CBT (versus wait-list, MI, or another intervention), five studies assessed contingency management (versus CBT or another intervention), nine studies mainly assessed MI (versus wait-list or another intervention) and one assessed web-based counselling.

All the included RCTs measured the effect of the intervention(s) on participant's cannabis usage, although, the way in which this was measured varied greatly by study. Eleven studies measured participants' severity of cannabis dependence (measured via self-report using various instruments, most frequently using the Severity of Dependence Scale (SDS) or Addiction Severity Index (ASI) (McLellan, Luborsky, Woody, & O'Brien, 1980; Swift, Copeland, & Hall, 1998). Fourteen studies measured participants' number of cannabis related problems (measured using various instruments, including the Cannabis Problems Questionnaire (CPQ) (Copeland, Gilmour, Gates, & Swift, 2005). Nineteen studies measured participant's usage of the intervention or session attendance. For the narrative synthesis, outcomes were grouped into four groups: cannabis usage, severity of dependence, number of dependence symptoms and number of cannabis problems.

Quality assessment

Most studies used an appropriately generated randomisation sequence, with 17 studies being deemed "low risk", seven "unclear risk", and one "high risk" for this measure. No studies blinded study participants to group allocation; we deemed this form of blinding to be impossible for the interventions under review. As many of the outcome measures were self-reported, outcomes were deemed to have been blinded if the outcome assessors were blinded to group allocation. This form of blinding was poorly reported – in 14 studies, blinding of outcome assessment was unclear or unreported. Participant attrition was well reported but high, ranging from 6% to 79% (mean 31%, median 25%); 17 studies were rated as high risk for this attribute (with attrition of more than 20% at the final follow-up time point). Regarding overall risk, 18 studies were deemed to be "high risk", in seven studies the risk was unclear and no studies were deemed to be "low risk".

Effectiveness of psychological and psychosocial treatments

Tables 2 and 3 summarise the studies included in the seven comparison groups, including interventions and between group differences at post-treatment (Table 2) and follow-up (Table 3).

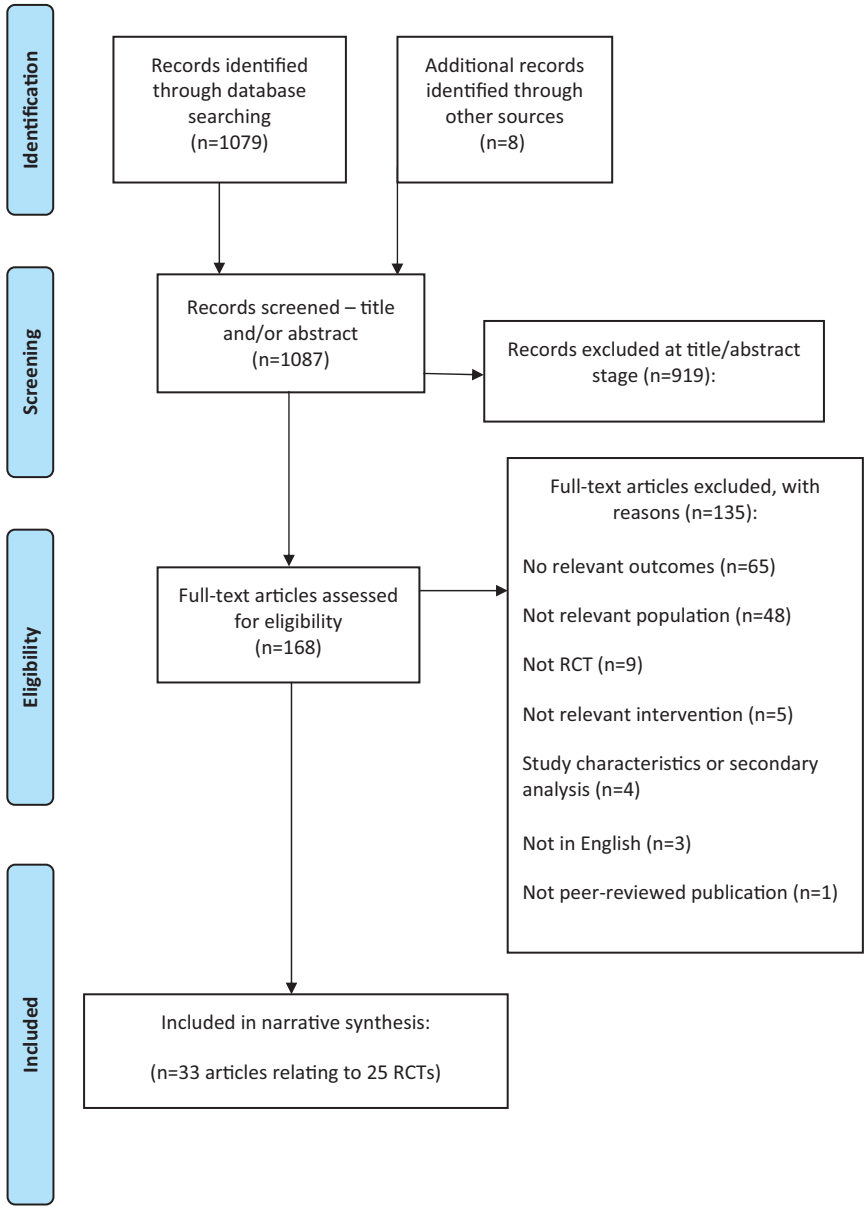

Figure 1. Study selection process – Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

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CBT versus wait-list control

Six studies (Babor et al., 2004; Copeland, Swift, Roffman, & Stephens, 2001; Hoch et al., 2012, 2014; Jungerman, Andreoni, & Laranjeira, 2007; Stephens, Roffman, & Curtin, 2000) compared CBT (4–14 sessions) versus wait-list control. Five (Babor et al., 2004; Copeland et al., 2001; Hoch et al., 2012, 2014; Jungerman et al., 2007) provided individual CBT sessions and one (Stephens et al., 2000) group sessions. CBT interventions also incorporated other components including case management (Babor et al., 2004) and a social support group (Stephens et al., 2000). The majority of studies only included participants who met the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria for cannabis dependence (Babor et al., 2004; Copeland et al., 2001; Hoch et al., 2012; Stephens et al., 2000). The remaining studies included participants who used cannabis a certain number of times a month (Hoch et al., 2014; Jungerman et al., 2007).

Five studies (Babor et al., 2004; Hoch et al., 2012, 2014; Jungerman et al., 2007; Stephens et al., 2000) reported post treatment (5–18 weeks) outcomes. All five reported significantly better results for CBT (4–14 sessions) than for wait-list on all key outcomes (cannabis usage, severity of dependence, dependence symptoms, and cannabis problems). Effect sizes were small to very large where reported. Full intervention session attendance ranged from 65% (Hoch et al., 2014) to 86% (Hoch et al., 2012).

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Table 1. Characteristics of included studies

Study (country, mode of recruitment)	Interventions (Number of sessions)	Number of cannabis users	Inclusion criteria: age	Mean age at BL (range)	Level of cannabis use/dependence[a]	Mean cannabis use at BL
Babor et al. (2004) and Litt et al. (2005) (USA, voluntary and referral)	– CBT/MET/CaseM (9) – MET (2) – Wait-list	450	≥18	36 (18–62)	*High use*: DSM-IV cannabis dependence; cannabis used ≥40 out of 90 d	27 d/month
Budney et al. (2011) and Budney (2013) (USA, voluntary)	– CBT/MET/voucher (9) – Computer CBT/MET + brief therapist + voucher (9) – MET (2)	45	18–65	35 (range NR)	*High use:* DSM-IV cannabis abuse or dependence and used cannabis ≥40 of previous 90 d	NR
Budney et al. (2006) (USA, voluntary and referral)	– CBT (14) – CBT/vouchers (14) – Vouchers	60	≥18	33 (range NR)	*High use:* Met DSM-IV cannabis dependence and used cannabis in past 30 d	26 d/month
Budney et al. (2000) and Moore and Budney (2003) (USA, voluntary)	– CBT/MET (14) – MET (4) – CBT/MET/vouchers (14)	60	≥18	32 (range NR)	*High use:* DSM-III-R classification for cannabis dependence; cannabis use in previous 30 d	23 d/month
Copeland et al. (2001) (Australia, voluntary)	– CBT (6) – MI (1) – Wait-list	229	≥18	32 (range NR)	*High use:* DSM-IV cannabis dependence	NR
De Dios et al. (2012) (USA, voluntary)	– MI/meditation (2) – AO	39	18–29	23 (range NR)	*Low use:* ≥3 times past month	18 d/month
Fernandes et al. (2010) (Brazil, voluntary)	– tele-Brief MI (1) – Written cannabis information	1744	NR	25 (11-NR)	NR	NR
Fischer et al. (2012, 2013) (Canada, voluntary)	– Brief MI (1) – Written cannabis information – Therapist general health MI (1) – Written general health information	134	18–28	20 (range NR)	*Low use:* Used for >1 year, at least 12 of past 30 d	24 d/month
Gates et al. (2012) (Australia, voluntary)	– tele-CBT/MI (4) – Wait-list	160	≥16	36 (range NR)	*Low use*: ≥1 use cannabis in last month	NR
Gmel et al. (2013) (Switzerland, voluntary)	– Brief MI (1) – AO	378	19–20	20 (19–20)	NR	7–9 d/month
Hoch et al. (2014) (Germany, referral)	– CBT/MET/PPS (10) – Wait-list	385	≥16	27 (16–63)	*Low use:* ≥9 d/month	20 d/month
Hoch et al. (2008, 2012) (Germany, voluntary and referral)	– CBT/MET/PPS (10) – Wait-list	122	≥16	24 (16–44)	*High use:* DSM-IV cannabis dependence/abuse 89%	NR

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Table 1. Continued

Study (country, mode of recruitment)	Interventions (Number of sessions)	Number of cannabis users	Inclusion criteria: age	Mean age at BL (range)	Level of cannabis use/dependence[a]	Mean cannabis use at BL
Humeniuk et al. (2012) (Worldwide, referral)	– Brief MI (1) – Wait-list	395	16–62	31 (range NR)	NR	NR
Jungerman et al. (2007) (Brazil, NR)	– CBT/MI/RP (4) (3mth) – CBT/MI/RP (4) (1mth) – Wait-list	160	≥18	32 (18–58)	*Low use:* ≥13 d/month	26–28 d/month
Kadden et al. (2007) and Litt et al. (2008) (USA, voluntary)	– CBT/MET (9) – CaseM (9) – CBT/MET/vouchers (9) – Vouchers	240	≥18	33 (range NR)	*High use:* DSM-IV cannabis dependence	NR
Lee et al. (2013) (USA, referral)	– Brief MI (1) – AO	212	18–25	20 (range NR)	*Low use:* ≥5 d/month	16–17 d/month
Lee et al. (2010) (USA, referral)	– Web-based-personalised feedback (1) – AO	341	17–19	18 (range NR)	*Low use:* any use	3 d/month
Litt et al. (2013) (USA, voluntary)	– CBT/MET/vouchers(homework) (9) – CBT/MET/vouchers (abstinence) (9) – CaseM (9)	215	≥18	33 (range NR)	*High use:* DSM-IV cannabis dependence	24 d/month
Rooke et al. (2013) (Worldwide, voluntary)	– Web-based CBT/MI (6) – Web-based written cannabis information	230	≥18	31 (range NR)	*Low use:* ≥1 d/month	21 d/month
Sobell et al. (2009) (Canada, voluntary and referral)	– CBT/MI (4) (group) – CBT/MI (4) (individual)	17	≥18	32 (range NR)	*Low use:* "not severe dependence"	27 d/month
Stein et al. (2011) (USA, voluntary)	– MI (2) – AO	332	18–24	21 (range NR)	*Low use:* ≥1 d/month	17 d/month
Stephens et al. (2007) (USA, voluntary)	– MI/personalised feedback (1) – Cannabis education (1) – Wait-list	188	≥18	32 (18–57)	*High use:* ≥15 d/month	26 d/month
Stephens et al. (2000), Lozano et al. (2006), and DeMarce et al. (2005) (USA, voluntary)	– CBT/RP/social support (14) – MI (2) – Wait-list	291	≥18	34 (range NR)	*High use:* DSM-III-R cannabis dependence	25 d/month
Stephens et al. (1994) (USA, voluntary)	– CBT/RP (10) – Social support group (10)	212	≥18	32 (18–65)	*High use:* ≥17 d/month	27 d/month
Tossmann et al. (2011) (Germany, voluntary)	– Web-based counselling – Wait-list	1292	NR	25 (range NR)	*High use:* "any use", 92% DSM-IV cannabis dependent at BL	NR

[a]Level of cannabis use/dependence was classified as follows: "high use": ≥80% of participants met DSM or ICD criteria for cannabis dependence or abuse and/or inclusion criteria specified that all participants used cannabis on at least 50% days over a specified time period.

AO, Assessment Only; ASI, Addiction Severity Index; BL, Baseline; CaseM-9, nine session Case Management; CBT, cognitive behavioural therapy; CBT-(N), CBT with *N* number of sessions; DSM, Diagnostic and Statistical Manual of Mental Disorders; MET, motivational enhancement therapy; MET-(N), motivational enhancement therapy with N number of sessions; MI, motivational interviewing; PPS, psychosocial problem solving; RP, relapse prevention; tele-brief MI-1, one session telephone delivered brief motivational intervention.

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Table 2. Results at post-treatment

Study % DSM[a] mean Age (range)	Intervention *N* sessions (*N* attended) Duration	Control *N* sessions (*N* attended) Duration	Post treatment difference between groups[b] % Abstinent	Days use	Joints per day	Periods use per day	Severity of dependence	Dependence symptoms	Cannabis problems
CBT versus wait-list									
Babor et al. (2004) 100% 36 (18–62)	CBT/MET/CaseM 9 (6.5) 12 weeks	Waitlist	Sig $p = NR$	Sig $p = NR$ $d = 1.14$	Sig $p = NR$ $d = 0.43$	Sig $p = NR$ $d = 0.91$		Sig[g] $p = NR$ $d = 0.9$	Sig[j] $p = NR$
Copeland et al. (2001)	CBT	Waitlist	No data						
Hoch et al. (2014) NR 27 (16–63)	CBT/MET/PPS 10 (NR) 12 weeks	Waitlist	Sig $p < 0.001$		Sig[c] $p < 0.001$		Sig[d] $p < 0.001$ $d = -0.6$ (95% CI −1.2, 0.2)	Sig $p < 0.001$ $d = -0.9$ (95% CI −1.1, −0.5)	Sig[k] $p < 0.001$ $d = -0.7$ (95% CI −1.3, 0.2)
Hoch et al. (2012) 89% 24 (16–44)	CBT/MET/PPS 10 (NR) 5–8 weeks	Waitlist	Sig $p < 0.01$		Sig[c] $p = 0.008$		Sig[f] $p < 0.001$ $d = -1.58$		
Jungerman et al. (2007) NR 32 (18–58)	CBT/MI/RP 4 (NR) 12 week	Waitlist		Sig $p = 0.0002$	Sig $p = 0.005$	Sig $p = 0.004$	Not sig[f] $p = 0.292$	Sig[h] $p = 0.018$	Not sig[j] $p = 0.16$
Stephens et al. (2000) 98% 34 (≥18)	CBT/RP/SSG (group) 14 (8.4) 18 week	Waitlist	Sig $p < 0.001$	Sig $p < 0.001$		Sig $p < 0.001$		Sig[i] $p < 0.001$	Sig $p < 0.001$
CBT/psychotherapy versus brief MI									
Babor et al. (2004) 100% 36 (18–62)	CBT/MET/CaseM 9 (6.5) 12 weeks	MET 2 (1.6) 5 weeks	Sig $p = NR$	Sig $p = NR$ $d = 0.52$	Not sig $p = NR$	Sig $p = NR$ $d = 0.4$		Sig[g] $p = NR$ $d = 0.52$	Sig[j] $p = NR$
Budney et al. (2000) 100% 32 (≥18)	CBT/MET 14 (NR) 14 weeks	MET 4 (NR) 14 weeks	Not sig $p = NR$	Not sig $p = NR$			Not sig[f] $p = NR$		Not sig[l] $p = NR$
Copeland et al. (2001)	CBT	MI	No data						
Stephens et al. (2000) 98% 34 (≥18)	CBT/RP/SSG (group) 14 (8.4) 18 weeks	MI (indiv.) 2 (NR) 4 weeks	Not sig $p = NR$	Not sig $p = NR$		Not sig $p = NR$		Not sig[i] $p = NR$	Not sig $p = NR$
CBT versus other interventions									
Jungerman et al. (2007) NR 32 (18–58)	CBT/MI/RP over 12 weeks 4 (NR) 12 week	CBT/MI/RP over 4 weeks 4 (NR) 4 weeks		Not sig $p = 0.671$	Not sig $p = 0.937$	Not sig $p = 0.301$	Sig[f] $p = 0.012$	Sig[h] $p = 0.035$	Sig[j] $p = 0.02$
Kadden et al. (2007) 100% 33 (≥18)	CBT/MET 9 (5.2) 9 weeks	CaseM 9 (5.2) 9 weeks		Not sig $p = NR$	Not sig $p = NR$		Not sig[f] $p = NR$		Not sig[j] $p = NR$
Sobell et al. (2009) Non-severe only 32 (≥18)	CBT/MI (indiv) 4 (NR) NR	CBT/MI (group) 4 (NR) NR		Not sig $p = 0.07$					
			Not sig $p < 0.10$	Not sig $p = NR$					Not sig[m] $p = NR$

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Table 2. Continued

Study % DSM[a] mean Age (range)	Intervention *N* sessions (*N* attended) Duration	Control *N* sessions (*N* attended) Duration	Post treatment difference between groups[b] % Abstinent	Days use	Joints per day	Periods use per day	Severity of dependence	Dependence symptoms	Cannabis problems
Stephens et al. (1994) NR 32 (18–65)	CBT/RP (group) 10 (7.6) 12 weeks	SSG (group) 10 (7.6) 12 weeks							
Telephone or web-based CBT or counselling versus wait-list or other									
Gates et al. (2012) NR 36 (≥16)	tele-CBT/MI 4 (3.3) 3 weeks	Waitlist		Not sig $p = 0.054$	Sig[d] $p = 0.017$		Sig[e] $p < 0.001$		Sig[k] $p < 0.001$
Rooke et al. (2013) NR 31 (≥18)	CBT/MI 6 (3.5) 6 weeks	Written cannabis information	Not sig $p = 0.10$	Sig $p = 0.02$ d = 0.30 (CI NR)			Not sig[e] $p = 0.49$ d = 0.10 (CI NR)		
Tossmann et al. (2011)	Web-based counselling	Waitlist	No data						
Brief MI versus wait-list/AO									
Babor et al. (2004) 100% 36 (18–62)	MET 2 (1.6) 5 weeks	Waitlist	Not sig $p = 0.10$	Sig $p = NR$ d = 0.59 (CI NR)	Sig $p = NR$ d = 0.29 (CI NR)	Sig $p = NR$ d = 0.6 (CI NR)		Sig[g] $p = NR$ d = 0.33 (CI NR)	Not sig[j] $p = NR$
Copeland et al. (2001)	MI	Waitlist	No data						
De Dios et al. (2012) 23 (18–29), female	MI/meditation 2 (2) 2 weeks	AO	Not sig $p = NR$	Sig $p = 0.015$					
Gmel et al. (2013)	Brief MI (group)	AO	No data						
Humeniuk et al. (2012)	Brief MI	Waitlist	No data						
Lee et al. (2013)	Brief MI	AO	No data						
Lee et al. (2010)	Web-based personalised feedback	AO	No data						
Stein et al. (2011) 40% 21 (18–24), female	MI 2 (1.7) 4 weeks	AO	Not sig $p = 0.174$						
Stephens et al. (2007) NR 32 (18–57)	MI/personalised feedback 1 (1) 1 week	Waitlist		Sig $p < 0.05$		Sig $p < 0.05$		Sig[g] $p < 0.05$	Not sig[j] $p = NR$
Stephens et al. (2000) 98% 34 (≥18)	MI 2 (NR) 4 weeks	Waitlist	Sig $p < 0.001$	Sig $p < 0.001$		Sig $p < 0.001$		Sig[i] $p < 0.001$	Sig $p < 0.001$
Brief MI versus other interventions									
Fernandes et al. (2010)	Tele-brief MI	Written cannabis information	No data						
Fischer et al. (2012)	Brief MI	Cannabis education	No data						
Stephens et al. (2007) NR 32 (18–57)	MI/personalised feedback 1 (1) 1 week	Cannabis education		Sig $p < 0.05$		Sig $p < 0.05$		Sig[g] $p < 0.05$	Not sig[j] $p = NR$

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Contingency management versus other							
Budney et al. (2000) 100% 32 (≥18)	CBT + V 14 (NR) 14 weeks	CBT or MET (NR) 14 weeks	Sig $p < 0.02$	Not sig $p = 0.12$		Sig[f] $p =$ NR	Not sig[l] $p =$ NR
	CBT 14 (NR) 14 weeks	MET 4 (NR) 14 weeks	Not sig $p =$ NR				
Budney et al. (2006) 100% 33 (≥18)	V n/a (n/a) 14 weeks	CBT 14 (8.8) 14 weeks	Sig[o] $p = 0.02$ OR = 6.0 (95% CI 1.7–21.0)[p]		Sig $p < 0.05$		
	CBT + V 14 (9.6) 14 weeks	CBT 14 (8.8) 14 weeks	Sig[o] $p = 0.20$ OR = 4.1 (95% CI 1.2–14.4)[p]				
	V n/a (n/a) 14 weeks	CBT + Voucher 14 (9.6) 14 weeks	Not sig $p = 0.32$				
	All groups			Not sig $p = 0.71$			Not sig[j] $p =$ NR
Budney et al. (2011) 100% 35 (18–61)	CompCBT + V and CBT + V	MET 9 (NR) 4 weeks	Sig $p < 0.05$				
	CompCBT + V 2 (NR) 12 weeks	CBT + V 9 (NR) 12 weeks	Not sig $p > 0.05$				
	All groups					Not sig[f] $p =$ NR	
Litt et al. (2013) 100% 33 (≥18)	CBT/MET/V (abstinence)9 (5.5) 2 months	CaseM 9 (6) 2 months					
	CBT/MET/V (abstinence)9 (5.5) 2 months	CBT/MET/V (homework)9 (5.7) 2 months	Sig $p < 0.03$				

AO, assessment only; CaseM, case management CBT, cognitive behavioural therapy; CBT + V, CBT plus voucher; CompCBT, computer CBT; CP, cannabis problems; CU, cannabis usage; MET, motivational enhancement therapy; MI, motivational interviewing; MtC, Motivation to change; NR, not reported; PPS, Psychosocial Problem Solving; RP, relapse prevention; SoD, Severity of Dependence; SSG, social support group; V, voucher (contingency management).

[a]% meeting criteria for cannabis dependence via DSM-III or DSM-IV.
[b]Defined as the first follow-up point after the end of treatment.
[c]Amount per week.
[d]Amount per day.
[e]SDS.
[f]ASI.
[g]DSM-IV.
[h]DSM-III.
[i]MDS.
[j]MPS.
[k]CPQ.
[l]MCQ.
[m]DAST.
[n]RMPI.
[o]Continuous abstinence.
[p]Abstinence for 6 weeks or more.

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Table 3. Results at follow-up

Study % DSM[a] mean Age (range)	Intervention (*N* attended) Duration	Control *N* sessions Duration	Follow-up from baseline	Follow up difference between groups[b]						
				% Abstinent	Days use	Joints per day	Periods use per day	Severity of dependence	Dependence symptoms	Cannabis problems
CBT versus wait-list										
Babor et al. (2004)	CBT/MET/CaseM	Waitlist		No data						
Copeland et al. (2001) 96% 32 (≥18)	CBT 6 (4.2) 6 weeks	Waitlist	9 m	Sig $p = 0.05$	Not sig $p =$ NR	Sig[c] $p = 0.02$		Sig[d] $p < 0.001$		Sig[k] $p < 0.001$
Hoch et al. (2014)	CBT/MET/PPS	Waitlist		No data						
Hoch et al. (2012)	CBT/MET/PPS	Waitlist		No data						
Jungerman et al. (2007)	CBT/MI/RP	Waitlist		No data						
Stephens et al. (2000)	CBT/RP/SSG	Waitlist		No data						
CBT/psychotherapy versus brief MI										
Babor et al. (2004) 100% 36 (18–62)	CBT/MET/CaseM 9 (6.5) 12 weeks	MET 2 (1.6) 12 weeks	9 m	Not sig $p =$ NR	Sig $p < 0.001$ d = 0.37	Not sig $p =$ NR	Sig $p < 0.01$		Sig $p < 0.01$ d = 0.31	Not sig[j] $p =$ NR
			15 m	Sig $p < 0.001$	Sig $p =$ NR d = 0.22	Not sig $p =$ NR				Not sig[j] $p =$ NR
Budney et al. (2000)	CBT/MET	MET		No data						
Copeland et al. (2001) 96% 32 (≥18)	CBT 6 (4.2) 6 weeks	MI 1 (NR) 6 weeks	9 m	Not sig $p = 0.6$	Not sig $p =$ NR	Not sig[c] $p = 0.3$		Sig[d] $p = 0.04$		Not sig[k] $p = 0.08$
Stephens et al. (2000) 98% 34 (≥18)	CBT/RP/SSG (group) 14 (8.4) 18 weeks	MI (indiv.) 2 (NR) 18 weeks	16 m	Not sig $p =$ NR	Not sig $p =$ NR		Not sig $p =$ NR		Not sig[i] $p =$ NR	Not sig $p =$ NR
CBT versus other interventions										
Jungerman et al. (2007)	CBT/MI/RP over 12 weeks	CBT/MI/RP over 4 weeks		No data						
Kadden et al. (2007) 100% 33 (≥18)	CBT/MET 9 (5.2) 9 weeks	CaseM 9 (5.2) 9 weeks	14 m		Not sig $p =$ NR	Not sig $p =$ NR		Not sig[f] $p =$ NR		Not sig[j] $p =$ NR
Sobell et al. (2009) Non-severe only 32 (≥18)	CBT/MI (indiv) 4 (NR) NR	CBT/MI (group) 4 (NR) NR		12 m	Not sig $p = 0.86$					
Stephens et al. (1994) NR 32 (18–65)	CBT/RP (group) 10 (7.6) 12 weeks	SSG (group) 10 (7.6) 12 weeks	15 m	Not sig $p =$ NR	Not sig $p =$ NR					Not sig[l] $p =$ NR
Telephone or web-based CBT or counselling versus wait-list or other										
Gates et al. (2012) NR 36 (≥16)	tele-CBT/MI 4 (3.3) 3 weeks	Waitlist	3 m		Not sig $p = 0.057$	Not sig[c] $p = 0.340$		Sig[d] $p = 0.001$		Sig[k] $p = 0.006$
Rooke et al. (2013) NR 31 (≥18)	CBT/MI 6 (3.5) 6 weeks	Written cannabis information	3 m	Not sig 0.06 d = 0.25	Sig $p = 0.02$ d = 0.33			Not sig[e] $p = 0.001$		

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Tossmann et al. (2011) 92% 25 (NR)	Web-based counselling NR 7 weeks	Waitlist	3 m		Sig $p<0.001$			
Brief MI versus wait-list/AO								
Babor et al. (2004)	MET	Waitlist		No data				
Copeland et al. (2001) 96% 32 (≥18)	MI 1 (NR) 1 week	Waitlist	9 m	Sig $p=0.05$	Not sig $p=0.09$	Not sig[d] $p=0.2$	Sig[e] $p=0.008$	Sig[k] $p=0.004$
De Dios et al. (2012) NR 23 (18–29), female	MI/meditation 2 (2) 2 weeks	AO	3 m	Not sig $p=$NR	Sig $p=0.026$			
Gmel et al. (2013) NR 20 (19–20), male	Brief MI (group) 1 (NR) 1 week	AO	6 m		Not sig $p=0.342$			
Humeniuk et al. (2012) Low use only 31 (16–62)	Brief MI 1 (1) 1 week	Waitlist	3 m		Sig $p<0.05$			
Lee et al. (2013) NR 20 (18–25), students	Brief MI (in person or written) 1 (NR) 1 week	AO	3 m		Not sig $p=$NR RR = 0.96, 95% CI 0.80, 1.15	Sig[c] $p<0.05$ RR = 0.76, 95% CI 0.60, 0.96		Not sig[n] $p<0.10$ RR = 0.9, 95% CI 0.76, 1.07
			6 m		Not sig $p=$NR RR = 1.11, 95% CI 0.85, 1.43			Not sig[n] $p=$NR RR = 1.15, 95% CI 0.90, 1.47
Lee et al. (2010) NR 18 (17–19), students	Web-based personalised feedback 1 (NR) 1 week	AO	3 m		Not sig $p=$NR			Not sig[n] $p=$NR
			6 m		Not sig $p=$NR			Not sig[n] $p=$NR
Stein et al. (2011) 40% 21 (18–24), female	MI 2 (1.7) 4 weeks	AO	3 m	Sig $p=0.010$				
			6 m	Not sig $p=0.202$				
Stephens (2007)	MI/personalised feedback	Waitlist		No data				
Stephens (2000)	MI	Waitlist		No data				
Brief MI versus other interventions								
Fernandes et al. (2010) NR 25 (11-NR)	Tele-brief MI 1 (NR) 1 week	Written cannabis information	6 m	Sig $p<0.05$ OR = 1.6, 95% CI 1.2, 2.0				
Fischer et al. (2012) NR 20 (18–28)	Brief MI 1 (NR) 1 week	Cannabis education	3 m		Not sig $p=$NR	Not sig $p=$NR		
			12 m		Not sig $p=$NR	Not sig $p=$NR		
Stephens et al. (2007) NR 32 (18–57)	MI/personalised feedback 1 (1) 1 week	Cannabis education	6 m		Not sig $p=0.408$		Not sig $p=$NR	Sig[g] $p=0.019$	Not sig[j] $p=$NR
			12 m		Sig $p=0.019$		Not sig $p=$NR	Sig[g] $p=0.049$	Not sig[j] $p=$NR

(continued)

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Table 3. Continued

Study % DSM[a] mean Age (range)	Intervention (*N* attended) Duration	Control *N* sessions Duration	Follow-up from baseline	Follow up difference between groups[b]						
				% Abstinent	Days use	Joints per day	Periods use per day	Severity of dependence	Dependence symptoms	Cannabis problems
Contingency management versus other										
Budney et al. (2000) 100% 32 (≥18)	CBT + V	CBT or MET		No data						
Budney et al. (2006) 100% 33 (≥18)	CBT + V 14 (9.6), 14 weeksV	14 (8.8), 14 weeks CBT	12 m	Not sig $p = 0.74$		Sig $p < 0.05$				
		CBT		Sig $p = 0.04$						
	V	14 (9.6), 14 weeks CBT + V		Sig $p < 0.05$						
	All groups			Sig $p < 0.01$	Not sig $p = 0.31$				Not sig[j] $p =$ NR	
Budney et al. (2011) 100% 35 (18–61)	CompCBT + V	MET	9 m	No data						
	CBT + V CBT + V	MET compCBT + V		No data No data						
	All groups			$p < 0.05$						
Kadden et al. (2007) 100% 33 (≥18)	All groups		14 m	Not sig $p =$ NR	Not sig $p =$ NR		Not sig[f] $p =$ NR	Not sig $p =$ NR	Not sig $p =$ NR	
Litt et al. (2013) 100% 33 (≥18)	CBT/MET/V 9(5.5) 2 month	CaseM 9(6) 2 month	8 m	Not sig $p =$ NR						
	CBT/MET/V 9(5.5) 2 month	CBT/MET/V (homework) 9(5.7) 2 month		Not sig $p =$ NR						

AO, assessment only; CaseM, case management; CBT, cognitive behavioural therapy; CBT + V, CBT plus vouchers; CompCBT + V, Computer CBT plus vouchers; CP, cannabis problems; CU, cannabis usage; MET, motivational enhancement therapy; MI, motivational interviewing; MtC, Motivation to change; NR, not reported; PPS, Psychosocial Problem Solving; RP, relapse prevention; SoD, Severity of Dependence; SSG, social support group; V, Voucher (Contingency Management).

[a]% meeting criteria for cannabis dependence via DSM-III or DSM-IV.
[b]Defined as the final follow-up point.
[c]Amount per week.
[d]Amount per day.
[e]SDS.
[f]ASI.
[g]DSM-IV.
[h]DSM-III.
[i]MDS.
[j]MPS.
[k]CPQ.
[l]MCQ.
[m]DAST.
[n]RMPI.

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Only one study (Copeland et al., 2001) reported between-group data at a later follow-up (9 months) point than post-treatment. This study reported significantly better results for CBT (six sessions) than wait-list on all key outcomes at 9 months post-baseline except days used (p NR).

CBT or psychotherapy versus brief MI

Four studies (Babor et al., 2004; Budney, Higgins, Radonovich, & Novy, 2000; Copeland et al., 2001; Stephens et al., 2000) compared CBT (6–14 sessions) versus brief MI/MET (1–4 sessions). Three studies (Babor et al., 2004; Budney et al., 2000; Copeland et al., 2001) provided individual CBT sessions while one (Stephens et al., 2000) compared group CBT against individual MET. CBT interventions also included case management (Babor et al., 2004) and a social support group (Stephens et al., 2000). All studies included only participants who met the DSM criteria for cannabis dependence.

Three CBT studies reported between group data post-treatment (at 12–18 weeks). One study (Babor et al., 2004) reported significant between group differences, finding that 9-session CBT was significantly better than 2-session MET on most key outcomes (all except joints per day), with small to medium effect sizes ($d = 0.4$–0.5, for days used and dependence symptoms). Full intervention session attendance ranged from 69% (Copeland et al., 2001) to 86% (Stephens et al., 2000).

Three studies reported between group data at later follow-ups. Results were mixed, with significant differences identified in cannabis usage outcomes in one study (Babor et al., 2004) at 9 and 15 months, but not at 9 months (Copeland et al., 2001) or 16 months (Stephens et al., 2000) in the other two studies. A significant difference was found between groups in the one study that reported severity of dependence at 9 months ($p = 0.04$) (Copeland et al., 2001) and dependence symptoms at 9 months ($p < 0.01$, $d = 0.31$) (Babor et al., 2004), but no significant differences were found when measured at 16 months in another study (Stephens et al., 2000). All three studies that reported cannabis problems found no significant between group differences at 9 months (Babor et al., 2004; Copeland et al., 2001), 15 months (Babor et al., 2004) or 16 months (Stephens et al., 2000).

CBT versus other interventions (or different CBT format or duration)

Four studies (Jungerman et al., 2007; Kadden, Litt, Kabela-Cormier, & Petry, 2007; Sobell, Sobell, & Agrawal, 2009; Stephens, Roffman, & Simpson, 1994) compared CBT (4–10 sessions) against another intervention, comprising a social support group (Stephens et al., 1994), case management sessions (Kadden et al., 2007) or compared individual versus group CBT (Sobell et al., 2009) or CBT over different durations (Jungerman et al., 2007). One study only included participants who met the DSM criteria (Kadden et al., 2007), while two included participants who consumed cannabis at a certain frequency (Jungerman et al., 2007; Stephens et al., 1994) and one study included individuals without "severe dependence" (Sobell et al., 2009). All four studies showed no significant between group differences at post-treatment for cannabis usage outcomes, but showed mixed results for cannabis problems and severity of dependence outcomes, with the same study (Jungerman et al., 2007) showing significant results for each. The same study also identified significant differences for dependence symptoms outcomes. Two studies reported average number of sessions attended across both study groups, reporting 76% (Stephens et al., 1994) and 58% (Kadden et al., 2007) attendance, with no significant differences between groups. At later follow-up points, no significant differences were identified for any key outcomes at 14 or 15 months.

Telephone or web-based CBT or counselling versus wait-list or other interventions

Three studies (Gates, Norberg, Copeland, & Digiusto, 2012; Rooke, Copeland, Norberg, Hine, & McCambridge, 2013; Tossmann, Jonas, Tensil, Lang, & Struber, 2011) compared telephone or web-based interventions versus wait-list or education controls. Interventions included telephone-CBT (Gates et al., 2012), web-CBT (Rooke et al., 2013) and web-counselling (Tossmann et al., 2011). One study included participants only if they met the DSM criteria for cannabis dependence (Tossmann et al., 2011), while two included participants based on their cannabis intake (Gates et al., 2012; Rooke et al., 2013).

Two studies measured outcomes at post-treatment time points (Gates et al., 2012; Rooke et al., 2013). Mixed results were identified for cannabis use outcomes, with significant reductions in usage for a 6 week CBT/MI intervention, with a small effect size ($d = 0.30$) (Rooke et al., 2013), and significant reductions in joints per day for a 3 week telephone CBT/MI intervention (Gates et al., 2012). Other cannabis use outcomes in the same two studies reported insignificant results (Gates et al., 2012; Rooke et al., 2013). The effect of web or telephone interventions on severity of dependence was mixed, with one study showing a significant improvement (Gates

et al., 2012) and another showing insignificant results and small effect ($d = 0.30$) (Rooke et al., 2013). One study reported the effect on cannabis problems and reported a significant decrease (Gates et al., 2012). All three studies reported telephone or web session completion, reporting 51% (Tossmann et al., 2011), 58% (Rooke et al., 2013) and 81% (Gates et al., 2012) attendance.

All three studies reported follow-up outcomes at 3 months. Cannabis usage outcomes were mixed, with some significant improvements in two studies providing 6–7 week interventions (Rooke et al., 2013; Tossmann et al., 2011), but no significant improvements in a study providing a 3 week intervention (Gates et al., 2012). Severity of dependence outcomes followed a similar pattern to that at post-treatment. Improvements in cannabis problems were significant in the one study reporting such outcomes (Gates et al., 2012).

Brief MI versus wait-list or assessment only

Ten studies (Babor et al., 2004; Copeland et al., 2001; de Dios et al., 2012; Gmel, Gaume, Bertholet, Fluckiger, & Daeppen, 2013; Humeniuk et al., 2012; Lee, Neighbors, Kilmer, & Larimer, 2010; Lee et al., 2013; Stein, Hagerty, Herman, Phipps, & Anderson, 2011; Stephens, Roffman, Fearer, Williams, & Burke, 2007; Stephens et al., 2000) compared a brief intervention (1–2 sessions of MET, MI or personalised feedback) versus wait-list or assessment only. One study assessed a web-based intervention (personalised feedback) (Lee et al., 2010). One study provided a group MI session (Gmel et al., 2013) while the other nine provided individual sessions. Three studies included participants only if they met the DSM criteria for cannabis dependence (Babor et al., 2004; Copeland et al., 2001; Stephens et al., 2000) while four studies included participants who consumed a certain quantity of cannabis per month (1–15 d used per month) (de Dios et al., 2012; Lee et al., 2013; Stein et al., 2011; Stephens et al., 2000), while this was not reported in two studies (Gmel et al., 2013; Humeniuk et al., 2012). Five studies implemented an upper age limit for study inclusion, ranging from 19 to 29 years (de Dios et al., 2012; Gmel et al., 2013; Lee et al., 2010, 2013; Stein et al., 2011).

Five studies reported between-group data post-treatment, showing a mixed picture with some significant effects. Cannabis use outcomes largely showed significant improvements, with all studies reporting at least one significant outcome. Effect sizes (reported in one study) were small to medium ($d = 0.29$–0.59) (Babor et al., 2004). Three studies reported dependence symptoms, identifying a significant improvement (Babor et al., 2004; Stephens et al., 2000, 2007) but a small to medium effect size in the one study that reported effect sizes (Babor et al., 2004). Three studies reported the effect on cannabis problems, with one reporting a significant effect (Stephens et al., 2000). Eight studies (Babor et al., 2004; Copeland et al., 2001; de Dios et al., 2012; Humeniuk et al., 2012; Lee et al., 2013; Stein et al., 2011; Stephens et al., 2000, 2007) reported session attendance, ranging from 80% to 100%.

At later follow-ups, seven studies reported mixed between-group results, with some significant effects. Cannabis use outcomes were mixed; studies reporting at shorter follow-up time-points (3 months) were more likely to report significant between group differences that those reporting long-term outcomes (6–9 months). One study reported RRs (risk ratios) at 3 and 6 months, showing reduced RR of cannabis usage at 3 months (RR = 0.96 and 0.76) but increased risk at 6 months (RR = 1.11) (Lee et al., 2013). One study reported significant improvements in severity of dependence at 9 months (Copeland et al., 2001). Three studies reported participant's cannabis problems between 3 and 9 months, with significant results reported in one study (Copeland et al., 2001).

Brief MI versus other interventions

Three studies (Fernandes et al., 2010; Fischer, Jones, Shuper, & Rehm, 2012; Stephens et al., 2007) compared a brief intervention (one session of MI or telephone MI) versus education controls (regarding cannabis or general health). All MI sessions were individual (not group). Two studies selected participants who used cannabis a certain number of days/uses per week (Fischer et al., 2012; Stephens et al., 2007); this was not reported in one study (Fernandes et al., 2010).

One study (Stephens et al., 2007) of MI (one session) versus education control reported post treatment outcomes, reporting significant improvements in cannabis usage, dependence and cannabis problems outcomes. The same study reported session attendance, where 89% of participants attended a MI session and 94% attended a "cannabis education" session.

At later follow-ups, all three studies reported cannabis use outcomes at time points ranging from 3 to 12 months, with one finding a significant result at 6 months (OR = 1.6) (Fernandes et al., 2010). One study reported both dependence symptoms and cannabis problems at 6 and 12 months, finding a significant decrease in dependence symptoms at both time points, but no

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significant differences in cannabis problems (Stephens et al., 2007).

Contingency management (vouchers for abstinence) versus other interventions

Five studies (Budney, Moore, Rocha, & Higgins, 2006; Budney et al., 2000, 2011; Kadden et al., 2007; Litt, Kadden, & Petry, 2013) compared contingency management (vouchers for abstinence assessed via urine tests), alone or in combination with CBT, versus other interventions. One study also assessed computer-based CBT plus contingency management (Budney et al., 2011). Comparators included CBT (Budney et al., 2000, 2006; Kadden et al., 2007) (9–14 sessions), MET (Budney et al., 2000, 2011) (2–4 sessions), case management (Kadden et al., 2007; Litt et al., 2013) (nine sessions) and CBT + vouchers (CBT plus vouchers for abstinence) for completed CBT homework (Litt et al., 2013). All studies included cannabis users only if they met the DSM criteria for cannabis dependence.

Four studies reported between-group data post-treatment; results favoured either CBT + vouchers or vouchers alone over CBT alone. Cannabis use outcomes showed a majority of significant differences between groups, with the results favouring either CBT + vouchers or vouchers alone over CBT alone. One study reported effect sizes for 6 weeks or more of continuous abstinence, which favoured vouchers over CBT and CBT plus vouchers over CBT alone (Budney et al., 2006). One study reported cannabis problems, and another reported severity of dependence, both reporting non-significant differences between contingency management and other interventions (Budney et al., 2006, 2011). Session attendance was reported by two studies and was similar between interventions, ranging from 61% to 69% (Budney et al., 2006; Litt et al., 2013).

Later follow-ups indicated that positive results were maintained for combined treatment with CBT + vouchers. However, the beneficial short-term results for vouchers alone were less likely to be maintained long-term. Four studies reported between-group data at 14–15 months, with all four reporting cannabis use outcomes, the majority of which were not significantly different between groups (Budney et al., 2006, 2011; Kadden et al., 2007; Litt et al., 2013). Severity of dependence and dependence symptoms were reported at 14 months in one study comparing case management, contingency management and CBT, finding no significant differences between groups (Kadden et al., 2007). Two studies found no significant differences between groups for cannabis problems at 12 and 14 months (Budney et al., 2006; Kadden et al., 2007).

Discussion

Across six studies of CBT (4–14 sessions) versus wait-list, CBT was significantly better on most outcomes (cannabis use, severity of dependence, cannabis problems), post-treatment (in all five studies with data) and at 9 months (in the one study with later follow-up). Four studies comparing CBT (6–14 sessions) against briefer MI/MET (1–4 sessions) gave mixed results, with two studies showing better results for CBT post-treatment and at 9–16 months, while two further studies showed few between-group differences; both CBT and MI gave significant improvements from baseline. One study of CBT versus social support group (10 sessions each) and another of CBT versus case management (nine sessions each) showed no significant differences between groups but all groups significantly improved from baseline with changes maintained at 14–15 months. One study each of telephone-CBT, web-CBT and web-counselling all showed significant improvements over wait-list or education control post-treatment and at 3 months. Ten studies assessing brief MI/MET (1–2 sessions) versus wait-list or assessment only (AO) gave mixed results, with brief MI appearing significantly better on some outcomes but not others, post-treatment and at 3–9 months. Results were similar for three studies comparing brief MI against education controls. Compared with studies assessing other interventions, those assessing brief MI tended to include younger participants due to six of the 13 studies (de Dios et al., 2012; Fischer et al., 2012; Gmel et al., 2013; Lee et al., 2010, 2013; Stein et al., 2011) implementing an upper age limit for study inclusion, ranging from 19 to 29 years. Five studies assessed contingency management (monetary vouchers for abstinence) in a clinically dependent population. Vouchers alone and CBT plus vouchers gave better results than CBT or MET alone post-treatment (three studies), while at 14–15 months positive results were maintained for CBT plus vouchers but less so for vouchers alone (two studies). A minority of the studies ($n = 9$) reported effect sizes for between group differences at post-treatment, and five studies reported such figures at later outcome assessments.

This review is inclusive in scope, including a wide range of studies, interventions and outcomes. Only RCTs were included, resulting in only the highest level evidence being analysed. This inclusivity resulted in a number of limitations. First, the inclusivity of studies resulted in the reporting of a diverse and heterogeneous group of outcomes. Peters, Nich and Carroll (2011) suggest a framework for evaluating outcomes in RCTs of cannabis cessation therapies, suggesting that frequency of cannabis use, severity of cannabis use, and

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psychosocial functioning provide the best model of end of treatment outcomes (Peters et al., 2011). In this review, we presented all key outcomes reported by the included studies, grouped into four categories (cannabis use, severity of dependence, dependence symptoms, and cannabis problems). Second, many studies did not report between group differences at post-treatment or follow-up, instead reporting change from baseline in each group, thus limiting the comparison that can be made between treatments. Those that did report between group differences did not always report effect sizes. The studies that did report effect sizes only report confidence intervals in the minority of cases. Finally, the inclusion criteria used to recruit participants into the studies were diverse. The majority of studies that assessed CBT recruited participants who met the DSM criteria for cannabis dependence, while other studies, assessing other interventions, recruited those who utilised cannabis a certain frequency per month. Therefore, currently we can only assess the effectiveness of CBT on "clinically dependent" individuals, and other interventions on individuals who may not be dependent on cannabis and have a wide range of cannabis usage.

To our knowledge, this is the first review that has attempted to synthesise all evidence regarding available psychological and psychosocial treatments for cannabis cessation. Other systematic reviews have included a similar set of studies, but have undertaken a meta-analysis. The most recent of which undertook a meta-analysis of 10 studies, two of which were not included in this review (due to participants being referred via the criminal justice setting in one study) (Sinha, Easton, Renee-Aubin, & Carroll, 2003), and the study not reporting outcomes for marijuana using population only in another (Davis et al., 2015; Roffman, Stephens, Simpson, & Whitaker, 1988). Behavioural therapies outperformed control conditions when all outcome and time variables were combined (Hedges' $g = 0.44$). Dutra et al. reviewed psychosocial interventions for cannabis dependence, including five studies that included regular cannabis users, two of which were not included in this review (due to participants being referred via the criminal justice setting in one study (Carroll et al., 2006) and participants being, on average, less than 18 years of age in another (Martin & Copeland, 2008), finding a large effect on cannabis use ($d = 0.81$, 95% CI = 0.25–1.36)). The present review did not identify conclusive evidence to support these findings. Meta-analysis, although providing clinically relevant estimations of effect sizes, is not always relevant, especially when undertaken on a set of heterogeneous studies (Higgins & Green, 2011). Although studies in this review were grouped by intervention and comparator, there was still considerable variation within the groups. The most notable heterogeneity within each comparison group within this review was the length and frequency of the intervention, the outcomes measures and follow-up time points. The present review did not include a number of studies included in previous reviews. This possibly limited the scope for undertaking meta-analyses, but did prevent further heterogeneity from being present in the data.

Future studies should carefully consider trial methodology. Many studies in the present review either did not follow up participants at post-treatment or later follow-ups, or did not undertake between group inferences at these time points. Studies should follow up patients beyond treatment cessation, and may wish to include an inactive control arm. Wait-list controls with long-term follow-up are also valuable, although this needs to be balanced against ethical considerations and acceptability to trial participants.

Conclusions

This systematic review has identified a disparate evidence base that differed most notably in the nature and length of the interventions, the comparator groups, the populations studied and the outcomes measured (differing in metrics used, statistics reported, and follow-up periods). There was a distinct lack of between group comparisons at long-term follow-up time points. Individuals recruited to the trials differed considerably in their cannabis use at baseline, with a cohort of trials (involving mostly CBT and contingency management interventions) requiring individuals to meet the DSM criteria for cannabis dependence. Based on the available evidence, courses of CBT improved outcomes in a self-selected population of cannabis users who are clinically dependent, although there is a lack of evidence to support the long-term effect of such interventions. Brief MI improved outcomes at post-treatment in a younger non-clinically dependent population, but this was not sustained in the long term (3–12 months). There is some evidence that CBT (6–14 sessions) may be more effective than briefer MI interventions although results were mixed. Contingency management may also enhance long-term outcomes in combination with CBT in a clinically dependent population. Intervention retention varied within comparison groups, although brief MI sessions appeared to have the highest attendance.

Declaration of interest

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