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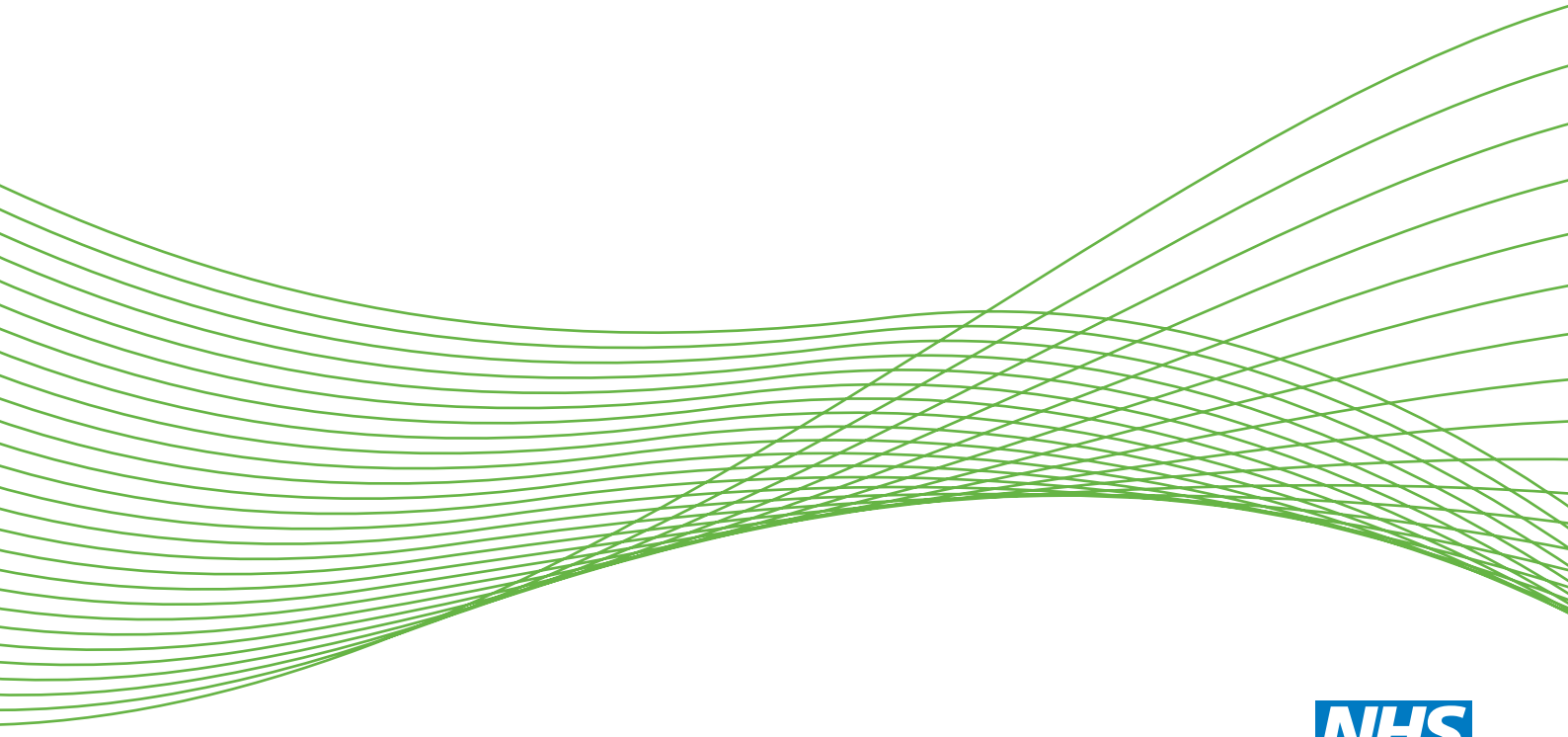

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Disclaimer: this report contains language that may offend some readers.

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Abstract

Psychological and psychosocial interventions for cannabis cessation in adults: a systematic review short report

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Background: Cannabis is the most commonly used illicit drug worldwide. Cannabis dependence is a recognised psychiatric diagnosis, often diagnosed via the *Diagnostic and Statistical Manual of Mental Disorders* criteria and the *International Classification of Diseases*, 10th Revision. Cannabis use is associated with an increased risk of medical and psychological problems. This systematic review evaluates the use of a wide variety of psychological and psychosocial interventions, such as motivational interviewing (MI), cognitive–behavioural therapy (CBT) and contingency management.

Objective: To systematically review the clinical effectiveness of psychological and psychosocial interventions for cannabis cessation in adults who use cannabis regularly.

Data sources: Studies were identified via searches of 11 databases [MEDLINE, EMBASE, Cochrane Controlled Trials Register, Health Technology Assessment (HTA) database, Database of Abstracts of Reviews of Effects, Cochrane Database of Systematic Reviews, NHS Economic Evaluation Database, PsycINFO, Web of Science Conference Proceedings Citation Index, ClinicalTrials.gov and *meta*Register of Current Controlled Trials] from inception to February 2014, searching of existing reviews and reference tracking.

Methods: Randomised controlled trials (RCTs) assessing psychological or psychosocial interventions in a community setting were eligible. Risk of bias was assessed using adapted Cochrane criteria and narrative synthesis was undertaken. Outcomes included change in cannabis use, severity of cannabis dependence, motivation to change and intervention adherence.

Results: The review included 33 RCTs conducted in various countries (mostly the USA and Australia). General population studies: 26 studies assessed the general population of cannabis users. Across six studies, CBT (4–14 sessions) significantly improved outcomes (cannabis use, severity of dependence, cannabis problems) compared with wait list post treatment, maintained at 9 months in the one study with later follow-up. Studies of briefer MI or motivational enhancement therapy (MET) (one or two sessions) gave mixed results, with some improvements over wait list, while some comparisons were not significant. Four studies comparing CBT (6–14 sessions) with MI/MET (1–4 sessions) also gave mixed results: longer courses of CBT provided some improvements over MI. In one small study, supportive–expressive dynamic psychotherapy (16 sessions) gave significant improvements over one-session MI. Courses of other types of therapy (social support group, case management) gave similar improvements to CBT based on limited data. Limited data indicated that telephone- or internet-based interventions might be effective. Contingency management (vouchers for abstinence) gave promising results in the short term; however, at later follow-ups, vouchers in combination with CBT gave better results than vouchers or CBT alone. Psychiatric population studies: seven studies assessed psychiatric populations (schizophrenia, psychosis, bipolar disorder or major depression). CBT appeared to have little effect over treatment as usual (TAU) based on four small studies with design limitations (both groups received TAU and patients were referred). Other studies reported no significant difference between types of 10-session therapy.

Limitations: Included studies were heterogeneous, covering a wide range of interventions, comparators, populations and outcomes. The majority were considered at high risk of bias. Effect sizes were reported in different formats across studies and outcomes.

Conclusions: Based on the available evidence, courses of CBT and (to a lesser extent) one or two sessions of MI improved outcomes in a self-selected population of cannabis users. There was some evidence that contingency management enhanced long-term outcomes in combination with CBT. Results of CBT for cannabis cessation in psychiatric populations were less promising, but may have been affected by provision of TAU in both groups and the referred populations. Future research should focus on the number of CBT/MI sessions required and potential clinical effectiveness and cost-effectiveness of shorter interventions. CBT plus contingency management and mutual aid therapies warrant further study. Studies should consider potential effects of recruitment methods and include inactive control groups and long-term follow-up. TAU arms in psychiatric population studies should aim not to confound the study intervention.

Study registration: This study is registered as PROSPERO CRD42014008952.

Funding: The National Institute for Health Research HTA programme.

Contents

List of tables

List of figures

Glossary

Bipolar disorder A mental disorder characterised by episodes of elevated mood alternating with episodes of depression.

Cannabis withdrawal syndrome Symptoms following cannabis withdrawal, including dysphoric mood, disturbed sleep and gastrointestinal symptoms.

Case management A strategy to improve the co-ordination and continuity of the delivery of services to a patient.

Cognitive–behavioural therapy A therapy that aims to change the way the participant thinks or behaves.

Contingency management Providing clients with tangible rewards (such as monetary vouchers) to reinforce behaviour change (e.g. a reduction or cessation in drug taking).

Dual diagnosis The condition of suffering from a mental illness and a substance abuse problem.

Hyperemesis syndrome A disorder characterised by nausea, vomiting and abdominal pain, caused by regular cannabis use.

Key working When a health professional works with the individual to ensure delivery and ongoing review of care being received.

Major depressive disorder A mental disorder characterised by low mood, low self-esteem and loss of interest in normally enjoyable activities.

Motivational enhancement therapy A variant of motivational interviewing that is manual based.

Motivational interviewing A person-centred approach that aims to improve motivation to change and resolve ambivalence to change.

Mutual aid therapy Therapy in which people with similar experiences assist each other to overcome or manage their issues (e.g. Self-Management and Recovery Training).

Nicotine replacement therapy The remedial administration of nicotine to the body by means other than tobacco, to aid cessation of smoking tobacco.

Psychosis disorder Generic psychiatric term for a mental state involving a loss of contact with reality.

Relapse prevention Based on cognitive–behavioural therapy; enables clients to cope with high-risk situations that may lead to drug taking.

Schizophrenia spectrum diagnosis Mental disorders with similar features to schizophrenia; may include hallucinations, delusions, motivational loss and withdrawal.

Supportive–expressive dynamic psychotherapy Psychotherapy involving supportive techniques to put patient at ease and expressive techniques to help understand role of drugs in feelings/behaviours and other means of resolving problems.

List of abbreviations

AO	assessment only
ASI	Addiction Severity Index
CBT	cognitive–behavioural therapy
CI	confidence interval
CPQ	Cannabis Problems Questionnaire
DSM	*Diagnostic and Statistical Manual of Mental Disorders*
DSM-5	*Diagnostic and Statistical Manual of Mental Disorders*-Fifth Edition
DSM-III-R	*Diagnostic and Statistical Manual of Mental Disorders* Three (revised)
DSM-IV	*Diagnostic and Statistical Manual of Mental Disorders*-Fourth Edition
HTA	Health Technology Assessment
ICD-10	*International Classification of Diseases*, 10th Revision
MET	motivational enhancement therapy
MI	motivational interviewing
MPS	Marijuana Problems Scale
NICE	National Institute for Health and Care Excellence
NRT	nicotine replacement therapy
PCT	person-centred therapy
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCQ	Readiness to Change Questionnaire
RCT	randomised controlled trial
RR	risk ratio
ScHARR	School of Health and Related Research
ScHARR-TAG	School of Health and Related Research Technology Assessment Group
SD	standard deviation
SDS	Severity of Dependence Scale
TAU	treatment as usual

Plain English summary

Regular users of cannabis risk become dependent on the drug. Treatments aiming to reduce cannabis use in regular users have focused on psychosocial and psychological interventions such as cognitive–behavioural therapy (CBT), which aims to manage cannabis use by managing negative behaviours through changing the way the participant thinks or behaves; motivational interviewing (MI), which helps people change behaviour by resolving ambivalence and improving motivation; and contingency management, voucher incentives for reductions in cannabis use. This systematic review assesses which treatment (or combination of treatments) is most effective at reducing cannabis use. Studies were of low quality and differed in the treatments they tested and the participants they recruited. We divided studies into those assessing 'general' cannabis users and those assessing cannabis users who also had a psychiatric condition. In the 'general' studies, CBT was more effective than no treatment in six studies, but this effect was assessed long term in only one study. Results were mixed when CBT was compared with brief MI and when brief MI was compared with no treatment. CBT with contingency management was more effective than CBT alone in the long term. In studies in people with psychiatric conditions, CBT showed limited benefit when compared with usual treatment; however, results were difficult to interpret owing to study design. Future research should focus on the number of treatment sessions required, effect of participant recruitment method on results (i.e. whether or not participants volunteered), selection of appropriate measures to assess changes in cannabis use, use of no-treatment control groups and long-term follow-up.

Scientific summary

Background

Cannabis is the most commonly used illicit drug worldwide. Chronic cannabis use is often defined as use on most days over a period of years. Cannabis dependence can develop from chronic use and is defined as impaired control over use and difficulty in ceasing use. Cannabis dependence is a recognised psychiatric diagnosis, often diagnosed via the *Diagnostic and Statistical Manual of Mental Disorders* criteria and the *International Classification of Diseases*, 10th Revision. Cannabis use is associated with an increased risk of medical and psychological problems. Research has looked into evaluating the use of a wide variety of psychological and psychosocial interventions, such as motivational interviewing (MI), cognitive–behavioural therapy (CBT) and contingency management.

Objectives

To systematically review the evidence for the clinical effectiveness of psychological and psychosocial interventions for cannabis cessation in adults who use cannabis regularly, in the form of a Health Technology Assessment (HTA) short report.

Methods

The systematic review included randomised controlled trials (RCTs) evaluating any psychological or psychosocial intervention for cannabis reduction or cessation in adult regular users. Studies of drug treatment (as intervention or comparator) were excluded. Studies were included if they involved all or mostly adult participants (≥ 18 years). Studies involving users of a range of drugs were included if they reported cannabis-related outcomes for the subgroup of regular cannabis users. Studies were excluded if they were based within the criminal justice system or within inpatient or emergency department settings or if the intervention was provided to partners/parents rather than the cannabis user. RCTs were identified through literature searching of 11 databases in February 2014 and from existing studies and reviews. Data were extracted by one researcher and checked by a second. Risk of bias was assessed using an adapted version of Cochrane risk of bias assessment criteria. Narrative synthesis was used to analyse results, subgrouped by intervention and comparator. Meta-analysis was not undertaken owing to heterogeneity in interventions, comparators, outcomes and follow-up periods. Key outcomes included change in cannabis use, severity of cannabis dependence, motivation to change and adherence to or attendance at the intervention. Patient and public involvement (service user input) was used to refine the protocol (research priorities and factors around implementation) and elements of the report (e.g. *Plain English summary*).

Results

The review included 33 RCTs conducted in a range of countries: the USA (13 studies), Australia (7), Germany (3), Brazil (2), Canada (2), Switzerland (2), Denmark (1), Ireland (1) and multicountry (2). The mean participant age was 29 years.

General population studies

Twenty-six studies assessed the general population of cannabis users (7643 randomised participants). Participants responded to advertisements in 16 studies and were referred for treatment in four studies, whereas four studies used advertisements and referrals (not reported in two). Participants in 13 studies were classed as having high baseline use/dependence and in 10 as low use (not reported in three). Risk of bias was assessed as high in 18 studies and unclear in eight studies.

Six general population studies compared CBT (4–14 sessions) with wait list. CBT appeared significantly better than wait list post treatment (in all five studies with data) on most outcomes (cannabis use, severity of dependence, cannabis problems). Improved outcomes for CBT (6 sessions) over wait list were maintained at 9 months post baseline in the one study reporting later follow-up. Four studies comparing CBT (6–14 sessions) against shorter MI or motivational enhancement therapy (MET) (1–4 sessions) gave mixed results, with two studies showing better results for CBT on most outcomes post treatment and at 9–16 months, whereas two further studies showed few between-group differences. Both CBT and MI gave significant improvements from baseline (three studies with data). One small study reported that supportive–expressive dynamic psychotherapy (16 sessions) improved abstinence rates and symptom severity post treatment significantly more than one-session MI. In addition, one study of CBT compared with a social support group (10 sessions each) and another study of CBT compared with case management (nine sessions each) both showed no significant differences between groups but all groups significantly improved from baseline with changes maintained at 14–15 months. Three studies (one each) assessed telephone-delivered CBT, internet-delivered CBT and internet counselling; all showed significant improvements over wait list or education control on some outcomes (varied by study) post treatment and at 3 months. Effect sizes from one study for post-treatment cannabis use outcomes were 0.4 to 1.1 (CBT vs. wait list), 0.4 to 0.5 (CBT vs. brief MI) and 0.3 to 0.6 (brief MI vs. wait list), and for severity of dependence were 0.9 (CBT vs. wait list), 0.4 to 0.5 (CBT vs. brief MI) and 0.3 (brief MI vs. wait list).

Ten general population studies assessing brief MI/MET (one or two sessions) compared with wait list or assessment only (AO) gave mixed results. MI appeared significantly better than wait list/AO on some outcomes but not others (cannabis use and dependence in most studies; cannabis problems in one study), both post treatment (in all five studies with data) and at 3–9 months (in all seven studies). Similar results were seen for three studies comparing brief MI against education controls.

Five general population studies assessed contingency management (monetary vouchers for abstinence). During and immediately post treatment, both vouchers alone and CBT plus voucher incentives (contingency management) gave better results than CBT or MET alone on some outcomes (in all three studies with data). In one study, the odds ratios for continuous abstinence for $\geq$ 6 weeks was 6.0 [95% confidence interval (CI) 1.7 to 21.0] for vouchers alone compared with CBT and 4.1 (95% CI 1.2 to 14.4) for CBT plus voucher incentives compared with CBT. However, at later follow-ups (14–15 months), positive results were maintained for CBT plus vouchers but less so for vouchers alone (in two studies with data).

Psychiatric population studies

Seven studies assessed cannabis users with psychiatric conditions (525 randomised participants). Conditions included schizophrenia, psychosis or bipolar disorder (two studies), schizophrenia spectrum diagnosis (one study), psychosis (two studies) and major depression (two studies). Patients were referred for treatment (four studies) or recruited via both referrals and advertisements (three studies). Participants in three studies were classed as having high baseline use/dependence and in four as having low use. Risk of bias was assessed as high in six studies and unclear in one study.

Four studies assessed CBT (6–24 sessions) plus treatment as usual (TAU) compared with TAU alone. TAU involved psychiatric treatment, including psychosocial interventions, in two studies and a self-help book on substance abuse in one study. There were few significant between-group differences in any cannabis-related outcomes post treatment, and none at 10–12 months (within four small studies with limited data), with little change from baseline in either group (no change in two studies; change in cannabis use in one study). Two studies reported no significant difference between different types of 10-session therapy: one compared CBT, computer-delivered CBT and person-centred therapy; the other compared CBT and psychoeducation; however, the latter reported significant improvements from baseline in both groups (limited data). A further study reported improvements for 10-session CBT or computer-delivered CBT over single-session MI at 12 months' follow-up on one outcome (daily cannabis use).

Subgroup analyses

Number of sessions

Longer courses of CBT appeared somewhat more effective than shorter courses of MI, but results were mixed and this finding is not conclusive. This is based first on four studies directly comparing CBT (6–14 sessions) with MI (1–4 sessions), in which two favoured CBT and two showed no difference; and, second, on the fact that studies of CBT (4–14 sessions) compared with wait list showed slightly more positive effects than studies of MI (one or two sessions) compared with wait list. Clinical effectiveness of CBT over MI may have been attributable to treatment content, number of sessions, or both. There was no clear effect of number of sessions on results, either within studies of CBT (4–14 sessions) compared with wait list or within studies of MI (one or two sessions) compared with wait list.

Group or individual treatment

Twenty-seven studies provided individualised treatments, whereas three provided group treatment and two compared group treatment with individual treatment. Limited comparisons suggested a slight advantage of individual over group treatment, but this was based on extremely limited data.

High compared with low baseline cannabis use/dependence and participant age: studies with low baseline use appeared slightly less likely to show significant differences on all outcomes than studies of high use, but this difference was not substantial or conclusive. Mean age was similar across studies within most intervention/comparator categories.

Discussion

Strengths

This review is inclusive in scope, including a wide range of studies, interventions and outcomes. Results were analysed using narrative synthesis, in order to provide an overview of the direction of effects for each population group (general vs. psychiatric) and each intervention/comparator category (such as CBT vs. wait list) at different time points and to minimise loss of data.

Limitations and uncertainties

There was substantial heterogeneity between included studies in terms of their populations, interventions, comparators, outcome measures and data format, and most studies were considered at high risk. Owing to this heterogeneity, results were presented as an overview of outcomes reported per study and how many of these outcomes showed a significant difference. Detailed numerical results per study group were not presented in the main results section and meta-analysis was not undertaken. However, the narrative synthesis approach was thought to provide benefits in terms of interpretability. Studies in languages other than English were not included owing to time constraints.

Generalisability of findings

The included studies utilised various recruitment methods, involving voluntary recruitment, referral by a health-care professional, or both. The general population studies mostly used voluntary recruitment via advertisement and may therefore reflect more motivated populations and may not be generalisable to all cannabis users. In addition, the included studies recruited cannabis users with varying frequencies of cannabis use at baseline.

Conclusions

Implications for service provision

Owing to the heterogeneity (of interventions, comparators, outcomes and populations) and high risk of bias of the included studies, conclusions should be interpreted with caution. Based on the available evidence, courses of CBT and (to a lesser extent) one or two sessions of MI improved outcomes in a self-selected population of cannabis users. 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. Results of CBT for cannabis cessation in psychiatric populations were less promising, but may have been affected by provision of TAU in both groups and the referred populations.

Suggested research priorities

The highest priority research area should be the investigation of the effects of number and frequency of sessions; in particular, the effectiveness of shorter courses of therapy, either brief motivational interventions (e.g. 1 or 2 sessions) or shorter courses of CBT (e.g. 4–6 sessions). It may also be useful to assess relative cost-effectiveness of longer and shorter interventions. If shorter interventions are found to be as effective as, or more effective than, longer interventions, such treatments could be made more widely available. Combined CBT plus contingency management (vouchers for abstinence) may be worthy of further study. In addition, mutual aid therapies and self-help groups (for which no RCTs were identified in this review) may be worth investigating, as well as interventions such as nicotine replacement therapy in conjunction with other treatments. Studies should report included interventions in sufficient detail to allow replication.

The effects of recruitment method (i.e. voluntary vs. referral) should be considered. In this review, most studies used voluntary recruitment, with the psychiatric studies using referral. Future studies may wish to align outcomes with existing studies when possible. The main classes of outcome in this review were level of attendance, cannabis use (via a range of measures), severity of dependence and cannabis-related problems. Trial methodology should be carefully considered. In populations with psychiatric conditions, TAU arms should not confound the study intervention when possible. 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; however, this needs to be balanced against ethical considerations and acceptability to trial participants.

Study registration

This study is registered as PROSPERO CRD42014008952.

Funding

The National Institute for Health Research HTA programme.

Chapter 1 Background

Description of health problem

Overview of cannabis use

Cannabis use may be defined as acute (occasional) or chronic, with chronic use often defined as use on most days over a period of years.[1] Cannabis dependence can develop from chronic use and is characterised by impaired control over use and difficulty in ceasing use.[1] Cannabis dependence is a recognised psychiatric diagnosis, often diagnosed via the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) criteria and the *International Classification of Diseases*, 10th Revision (ICD-10).[2,3]

Cannabis use has been found to exacerbate the symptoms of psychiatric disorders.[4] In one study, individuals who used cannabis regularly were found to be six times more likely to have a mood or anxiety disorder.[5] The term 'dual diagnosis' is used to describe individuals who have a mental health problem and also are dependent on drugs (or alcohol).[6]

Epidemiology and prevalence

Cannabis is the most commonly used illicit drug worldwide.[7] In one study reporting cannabis use in European countries, use for 20 or more days per month ranged from 3.5% to 44.1%, with the figure for the UK being 3.9%.[8] In Australia, the prevalence of *Diagnostic and Statistical Manual of Mental Disorders*-Fourth Edition (DSM-IV)-defined cannabis abuse in the general population over a 12-month period has been estimated at 2.3%, whereas a national survey undertaken in the USA found that 6% of individuals who used cannabis within a 1-year period met the DSM-IV criteria for cannabis dependence.[9,10] This figure, as would be expected, varies by country. In Australia, 31.7% of individuals who used cannabis more than five times in the past year met the criteria for a cannabis use disorder.[11,12]

Estimates for the prevalence of patients with a 'dual diagnosis' (substance abuse disorder and mental health problems) vary across sources, but it is frequently reported that over 50% of patients with mental health problems also have a substance abuse problem.[6]

Impact of health problem and prognosis

The impact of cannabis use on the individual can be classed as acute or chronic. Acute effects include hyperemesis syndrome (recurrent nausea, vomiting and abdominal pain), impaired co-ordination and performance, anxiety, suicidal ideations/tendencies, impaired attention and memory and psychotic symptoms.[2,13] Chronic effects include development of cannabis dependence, cognitive impairment, pulmonary disease and malignancy of the oropharynx.[2,13] There is increasing evidence to suggest the presence of a cannabis withdrawal syndrome, with symptoms (such as dysphoric mood, disturbed sleep and gastrointestinal symptoms) beginning during the first week and continuing for several weeks following the start of abstinence.[4] In a study by Budney *et al.*,[14] 47% of participants withdrawing from cannabis reported four or more severe symptoms, including irritability, craving and nervousness; other symptoms were less severe and included depression, restlessness and headaches.

In a cohort study comparing those seeking treatment with non-treatment seekers, those seeking treatment reported increased cannabis use and more symptoms of dependence but a more positive attitude to treatment.[15] Even when an individual has sought treatment, recovery from substance dependence is hampered by poor adherence to psychological and psychosocial treatments, with factors such as cognitive defects, personality disorder and younger age predicting low treatment adherence.[16]

Measurement of disease

Cannabis abuse and dependence is diagnosed using one or more assessment criteria, the most widely used being DSM-IV and ICD-10. There are DSM-IV criteria for both substance dependence and abuse.[3] Dependence is defined as tolerance (a need for increased amounts of the substance to achieve the desired effect), withdrawal (either having withdrawal symptoms or taking another substance to avoid withdrawal symptoms), taking substance in larger amounts than intended, and having persistent desire or unsuccessful efforts to cut down use. Substance abuse is characterised by recurrent use resulting in failure to fulfil obligations, recurrent use in hazardous situations, recurrent substance-related legal problems and continued use despite recurrent social or interpersonal problems. For both sets of criteria, individuals meeting three or more criteria within a 12-month period meet the diagnosis. In 2013, the updated *Diagnostic and Statistical Manual of Mental Disorders*-Fifth Edition (DSM-5) criteria were released.[17] In the revised criteria, there is no distinction between abuse and dependence, but a spectrum of substance use disorders.[18]

Current service provision

Relevant national guidelines

Guidance from the National Institute for Health and Care Excellence (NICE) states that pharmacological interventions for chronic cannabis users are not well developed, so psychosocial interventions are the mainstay of effective treatment.[19] UK Department of Health guidelines for the treatment of chronic users recommend that clinicians should consider motivational interventions in mild cases and structured treatment with key working (when a health professional works with the individual to ensure delivery and ongoing review of care being received) in more heavy users, whereas cognitive–behavioural therapy (CBT) is recommended in cases with comorbid depression and anxiety.[20] European best practice guidance, produced by the European Monitoring Centre for Drugs and Drug Addiction, recommends the use of multidimensional family therapy for regular cannabis users, while individual sessions of CBT are stated to be possibly advantageous.[21]

Management of the condition

Providing treatment to chronic users of cannabis to reduce or cease their use is a relatively recent occurrence. Until the 1980s, it was thought that chronic cannabis use did not lead to dependence and treatment was, therefore, not required.[22] Since then, research has looked into evaluating the use of a wide variety of psychological and psychosocial interventions, such as motivational interviewing (MI), CBT and contingency management (voucher incentives).[12] There is limited evidence to suggest which of the many psychological and psychosocial interventions are the most effective at reducing cannabis use.

A number of systematic reviews have been undertaken to assess the benefits of such interventions for regular cannabis users, many of which included meta-analyses. However, they all had limited scope and, therefore, did not assess all the available evidence, and several further studies have been published since. A review by Denis *et al.*[12] that excluded studies in populations dependent on drugs other than cannabis analysed six randomised controlled trials (RCTs) via narrative synthesis, involving interventions such as CBT and motivational enhancement therapy (MET), finding that CBT provided improved outcomes over brief interventions, whereas voucher incentives were found to enhance treatment when used in combination with other therapies. Dutra *et al.*[23] undertook a meta-analysis, identifying five studies assessing the use of psychological treatments (including case management, CBT and relapse prevention), finding a significant difference between outcomes for cannabis use, with a mean effect size of 0.81 [95% confidence interval (CI) 0.25 to 1.36] when comparing intervention treatments with control [which consisted of motivational enhancement, wait list control and treatment as usual (TAU)]. Other reviews have focused on specific interventions to treat regular users of cannabis. Tait *et al.*[24] assessed the use of internet-delivered interventions, finding that such interventions provided a significant decrease in cannabis use at post treatment [g (Hedges' bias-corrected effect size) = 0.16, 95% CI 0.09 to 0.22; p-value < 0.001].

Previous reviews have also sought to investigate the effectiveness of such interventions across the spectrum of substance misuse, including alcohol and opioids. The review by Dutra *et al.*[23] reported that treatments incorporating both CBT and contingency management had the greatest effect sizes on substance use across a range of substances including cocaine, opiates and cannabis (Cohen's *d* 1.02), whereas the two treatments alone had smaller effect sizes on the same group of substances (contingency management, Cohen's *d* 0.58, 95% CI 0.25 to 0.90; CBT, Cohen's *d* 0.28, 95% CI 0.06 to 0.51). In contrast, a review by Hunt *et al.*[6] included RCTs of patients with a severe mental illness and substance dependence, finding no compelling evidence to suggest a significant decrease in substance use when comparing CBT over TAU [two studies, risk ratio (RR) 1.12, 95% CI 0.44 to 2.86] or of CBT plus MI over TAU (one study, mean difference 0.19, 95% CI –0.22 to 0.60). The use of MI alone compared with usual treatment had positive effects on abstinence from alcohol (one study, RR 0.36, 95% CI 0.17 to 0.75) but no effect on other substances (one study, RR –0.07, 95% CI –0.56 to 0.42).[6] Other reviews have focused on specific interventions for 'general' substance misuse. Magill *et al.*[25] analysed 52 studies assessing the use of CBT (plus pharmacological treatments in a number of studies) on a range of substance dependences (including alcohol, cannabis, opiates and cocaine), reporting a small effect on the reduction of substance use for those studies reporting relevant outcomes (34 studies, $g = 0.108$, 95% CI 0.051 to 0.165; p-value < 0.005). Wood *et al.*[26] assessed the use of computer-delivered interventions, finding that drug prevention programmes were effective at reducing use in the mid-term (12 months) but not at post treatment. Mindfulness-based interventions have also been found to be effective for substance abuse.[27]

Description of technology under assessment

Summary of interventions

This review assesses the clinical effectiveness of psychological and psychosocial interventions aimed at assisting regular cannabis users to reduce or cease their use. Only interventions delivered in an outpatient or community setting are included. A full list is provided in *Chapter 3*, *Methods for reviewing effectiveness*.

Chapter 2 Definition of the decision problem

Decision problem

The aim of this assessment was to systematically review the evidence for the clinical effectiveness of psychological and psychosocial interventions for cannabis cessation in adults who use cannabis regularly.

Population and setting

The relevant population included individuals ≥ 18 years of age who were regular users of cannabis and had participated in a study providing treatment(s) for cannabis use in a community or outpatient setting. Studies focusing specifically on treating cannabis users within prisons or the criminal justice system or in inpatient settings were excluded. Inclusion was not restricted according to level of cannabis use at baseline.

Interventions

Studies involving psychological and psychosocial interventions were included.

Relevant comparators

Comparators included other psychological and psychosocial interventions, waiting list control, TAU or no treatment (comparisons with drug treatments were excluded).

Key outcomes

The key outcomes for this review were frequency and amount of cannabis use; severity of dependence; motivation to change; level of cannabis-related problems (including medical and other); and attendance, retention and dropout rates. The results of the review were also used to formulate recommendations for future research.

Overall aims and objectives of assessment

The aims and objectives of this assessment were to systematically review the evidence for the clinical effectiveness of psychological and psychosocial interventions for cannabis cessation in people who use cannabis regularly.

Chapter 3 Assessment of clinical effectiveness

A systematic review was undertaken to evaluate the effectiveness of psychological and psychosocial interventions for cannabis cessation in adults who use cannabis regularly. The review was undertaken in accordance with the general principles recommended in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (www.prisma-statement.org/).[28] The completed PRISMA checklist is presented in *Appendix 1*.

Methods for reviewing effectiveness

Identification of studies

The following electronic databases were searched to February 2014 for published and unpublished research evidence: MEDLINE, EMBASE, Cochrane Controlled Trials Register, Health Technology Assessment (HTA) database, Database of Abstracts of Reviews of Effects, Cochrane Database of Systematic Reviews, NHS Economic Evaluation Database, PsycINFO and Web of Science Conference Proceedings Citation Index. This included reference searching within relevant systematic reviews and included studies, contact with experts and searching clinical trials databases (https://ClinicalTrials.gov and www.controlled-trials.com) and relevant websites, including United Nations Office on Drugs and Crime (www.unodc.org), DrugScope (www.drugscope.org.uk), American Society of Addiction Medicine (www.asam.org), National Institute on Drug Abuse (www.drugabuse.gov), Canadian Centre on Substance Abuse (www.ccsa.ca), and Canadian Society of Addiction Medicine (www.csam-smca.org).

The protocol for this review is available on request from the authors.

Inclusion and exclusion criteria

Population and setting

The relevant population included participants aged ≥ 18 years, who were regular users of cannabis. Inclusion was not restricted according to level of cannabis use at baseline. The review focused on studies in a community or outpatient setting.

Studies focusing on the following subpopulations were excluded:

- Studies in the setting of the criminal justice system, that is prisons, following release (on parole) or within the court system.
- Studies for which the majority of participants were young people (< 18 years of age). In studies of mixed age groups, data for subgroups aged ≥ 18 years were extracted if available or, if not, then the study was included if ≥ 80% of participants were aged ≥ 18 years or, if these data were not available, where the mean age of participants was ≥ 18 years, at baseline.
- Studies for which participants were treated in an inpatient setting, that is, the patient received treatment for regular cannabis use while occupying a hospital ward, drug rehabilitation centre or within an emergency department. Studies for which a subset of the participants were residing in inpatient psychological treatment centres were included, provided that the cannabis intervention was delivered as a standalone therapy rather than as an integrated part of psychological treatment.
- Studies in which the intervention, or a component of the intervention, was provided to participants other than the cannabis user (e.g. parents or partners). An example of such an intervention is Multidimensional Family Therapy.
- Studies in very specific subpopulations (such as indigenous communities or human immunodeficiency virus patients).

For studies covering abuse of more than one substance (i.e. poly-substance abuse, involving other drugs or alcohol), the following approach was taken:

- Studies were included only if they reported cannabis-use outcomes (rather than any drug use) for the subpopulation who were cannabis users.
- Studies were excluded if the entire study population was dependent on alcohol, cocaine, opiates, amphetamines or receiving methadone maintenance (as these are quite specific populations and less relevant to cannabis cessation).

Included interventions

Relevant interventions included a range of psychological and psychosocial interventions aiming to reduce or cease cannabis use. Combinations of therapies were included. All possible modes of delivery were included, including individual face-to-face or group sessions, plus interventions provided via the internet or telephone. Relevant interventions included:

- CBT – an approach aiming to manage cannabis use by changing the way the participant thinks or behaves[29]
- MI – a person-centred approach that aims to improve motivation to change and resolve ambivalence to change[30]
- MET – a variant of MI that is manual based[31]
- relapse prevention therapy – based on CBT, enables clients to cope with high-risk situations that may lead to drug taking[32]
- contingency management – providing patients with tangible rewards (such as monetary vouchers) in return for a reduction or cessation in drug taking[20]
- case management – a strategy to improve the co-ordination and continuity of the delivery of services to a patient[33]
- mutual aid therapy – therapy in which people with similar experiences assist each other to overcome or manage their issues (e.g. Self-Management and Recovery Training)
- other psychological and psychosocial interventions as identified within the review process.

Comparators

Comparators included other psychological and psychosocial interventions, waiting list control, TAU or no treatment. Studies comparing a psychosocial intervention with a drug treatment were excluded.

Outcomes

The key outcomes for this review were:

- frequency and intensity of cannabis use, via self-report, with or without confirmation by biological analysis (urinalysis, hair/saliva analysis)
  - number (%) of days used, time periods of use per day, amount per day
  - number (%) reporting abstinence following intervention
- severity of drug-related problems [measured via the Addiction Severity Index (ASI)][34]
- severity of dependence [measured via the Severity of Dependence Scale (SDS)][11]
- stage of change or motivation/contemplation to change [e.g. as measured by the Readiness to Change Questionnaire (RCQ)][31]
- level of cannabis-related problems – medical problems, legal problems, social and family relations, employment and support [assessed via questionnaires such as the Cannabis Problems Questionnaire (CPQ)][35]
- attendance, retention and dropout rates, measured as number of sessions attended or number (%) completing whole treatment period
- recommendations for future research.

Included study types
Only RCTs were included in this review.

Excluded study types
The following study types were excluded:

- non-randomised studies
- narrative reviews, editorials, opinion pieces
- reports written in a language other than English or published as meeting abstracts, if insufficient methodological details are reported in the abstract to allow critical appraisal of study quality and extraction of study characteristics and key outcomes.

Data extraction strategy
Titles and abstracts of citations identified by the searches were screened for potentially relevant studies by one reviewer and a 10% sample checked by a second reviewer (and a check for consistency undertaken). Full texts were screened by two reviewers. One reviewer performed data extraction for each included study. All numerical data were checked against the original article by a second reviewer and any disagreements were resolved through discussion. When studies comprised duplicate reports (parallel publications), the most recent and relevant report was used as the main source and additional reports checked for extra information. Excluded studies were tabulated (see *Appendix 3*).

Methods of data synthesis
Data were analysed via a narrative synthesis. As described by Popay *et al.*,[36] this method is based around grouping and tabulating the data in meaningful clusters, allowing results to be summarised (in the form of text and tables) to provide an overview of the direction of effect for each relevant subgroup. Within this review, studies were first divided into two main population subgroups (general cannabis users and those with a major psychiatric condition). Second, studies were categorised according to their intervention and comparison groups (e.g. CBT vs. wait list, CBT vs. MI, etc.). Third, results were tabulated for two key time points (post treatment and later follow-up). Within each study, outcomes at each time point were categorised according to whether or not they were significantly different between groups or between baseline and follow-up. Finally, summary tables were populated for each intervention/comparison. Outcomes across studies at each time point were summarised as being mainly significant, mainly not significant or mixed.

There was substantial heterogeneity between studies in terms of populations, interventions, comparators, outcome measures reported and statistics reported. To increase clarity, the main results of this review are presented in the form of an overview of the outcomes reported per study and how many showed a significant difference, as described above. Detailed numerical results per study group are not presented in the main results section, but are provided in *Appendix 4* for reference. Meta-analysis was not undertaken, as this would have required restricting each analysis to studies reporting the same outcome in a consistent format with full data and it was felt that the broad results picture might have been lost.

Subgroup analyses were undertaken with regard to number of treatment sessions, group/individual treatment, high/low cannabis use at baseline, recruitment method (referral vs. voluntary), participant age and use of other substances (tobacco and alcohol) at baseline.

Quality assessment of included studies
Methodological quality of included RCTs was assessed using an adapted version of the Cochrane risk of bias assessment criteria. This tool addresses specific domains, namely sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data and selective outcome reporting.[37] Outcome assessment was considered to be blinded if the person assessing or interviewing the participants was blinded to group allocation (although participants were not blinded and many of the data were self-reported). We made two adaptations to these criteria in

order to aid quality assessment. First, we utilised the '5-and-20 rule' for incomplete outcome data, as proposed by Schulz and Grimes.[38] Schulz and Grimes[38] state that a lower than 5% loss in participants probably leads to little bias, while a greater than 20% loss potentially poses serious threats to validity. We therefore defined < 5% attrition as 'low risk', between 5% and 20% attrition as 'intermediate risk' and > 20% attrition as 'high risk'. Attrition was defined as the percentage of patients not followed up at the final time point reported. The second adaptation we made to the Cochrane criteria was to add an 'overall risk' criterion, aiming to summarise the overall risk of studies. We categorised studies as low risk, high risk or unclear risk, determined using the following criteria. Low risk was allocated to studies where randomisation, allocation concealment, 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 (self-selection, sequential patients, odd and even), and/or when allocation was not concealed, and/or when incomplete data were deemed to be high risk. Unclear risk was allocated to all other studies.

Patient and public involvement

In order to seek patient and public input into the review, we recruited a service user through liaison with the project's clinical advisors, who was currently acting as a 'service ambassador' within their treatment service (an individual who has completed a treatment regime, ceased their primary substance use and is now involved in supporting patients at the treatment centre).

A short 'briefing document' using non-academic language was developed (see *Appendix 5*) in order to introduce the individual to the research. The briefing document included sections describing the basic principles of a systematic review, the general area in which the research is being undertaken (i.e. psychological/psychosocial treatments for regular users of cannabis) and the input required from the service user. The service user was compensated for the time spent at meetings and for travel expenses.

The review team met with the service user twice. The first meeting was scheduled once the protocol had been written. The service user provided valuable input into the following areas of the protocol:

- an additional intervention not already identified in the protocol (mutual aid therapy)
- two additional outcome measures that were felt to be important (daily time periods of cannabis use and contemplation to change)
- general approval of the focus of the review.

The review team then met with the service user after the draft report had been written, when the service user had the following inputs:

- suggested amendments to the plain English summary
- reviewed the suggested research priorities
- reviewed the section describing factors relevant to the NHS.

Results

Quantity of research available

The searches identified 1087 citations (1079 via database searches and eight via other sources). Of these, 919 citations were excluded at the title/abstract stage and 168 full-text articles were screened. Of these, 126 were excluded: 65 did not include relevant outcomes, 41 evaluated irrelevant populations, nine were not RCTs, five did not involve a relevant intervention, three detailed a non-relevant secondary analysis or study characteristic and three were not in English (excluded studies are listed in *Appendix 3*). In total, 42 articles relating to 33 RCTs were included in this review. The PRISMA flow chart is shown in *Figure 1*.

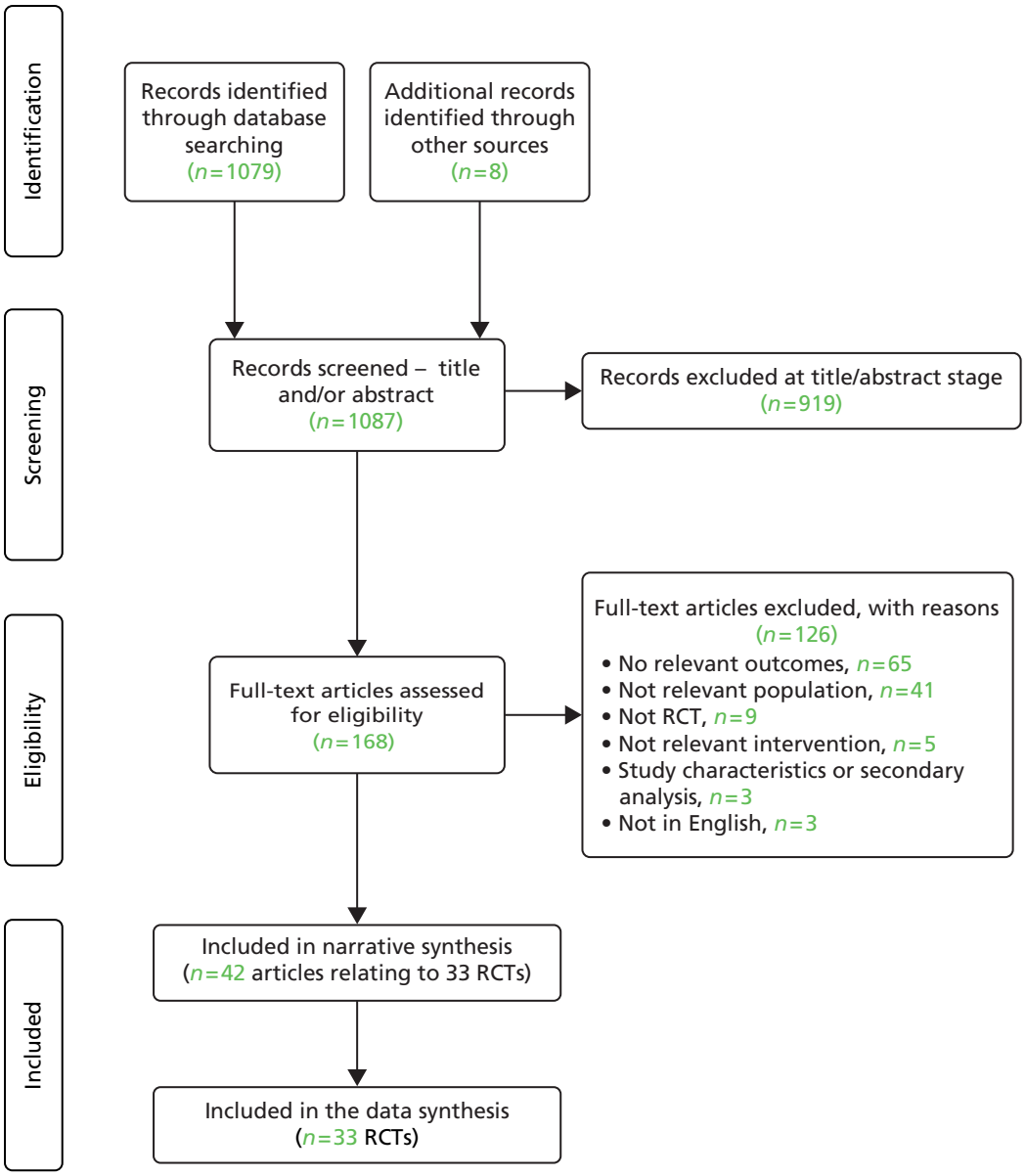

FIGURE 1 Study selection process: PRISMA flow diagram.

All titles and abstracts were screened for inclusion by one reviewer and a check for consistency was undertaken. A second reviewer screened approximately 10% of the references ($n = 100$) during the initial screening stage. No discrepancies were found.

Characteristics of included studies

The 33 studies included in this review were undertaken in a range of countries: the USA (13 studies[39–51]), Australia (seven studies[52–58]), Germany (three studies[59–61]), Brazil (two studies[62,63]), Canada (two studies[64,65]), Switzerland (two studies[66,67]), Denmark (one study[68]), Ireland (one study[69]) and worldwide (two studies, one utilising internet-based interventions[70] and the other undertaken in a number of locations worldwide[71]) (*Tables 1* and *2*).

TABLE 1 Characteristics of included studies: general population studies

Study (country, mode of recruitment)	Interventions (number of sessions)	Number of cannabis users	Inclusion criteria: age (years)	Mean age at BL (years) (range)	Level of cannabis use/dependence[a]
Babor 2004[39] and Litt 2005[72] (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 days
Budney 2011[42] and ClinicalTrials.gov 2013[73] (USA, voluntary)	CBT/MET/voucher (9); computer-delivered CBT/MET + brief therapist + voucher (9); MET (2)	45	18–65	35 (NR)	High use: DSM-IV cannabis abuse or dependence and used cannabis ≥ 40 of previous 90 days
Budney 2006[41] (USA, voluntary and referral)	CBT (14); CBT/ vouchers (14); vouchers	60	≥ 18	33 (NR)	High use: MET DSM-IV cannabis dependence and used cannabis in past 30 days
Budney 2000[40] and Moore 2003[74] (USA, voluntary)	CBT/MET (14); MET (4); CBT/MET/ vouchers (14)	60	≥ 18	32 (NR)	High use: DSM-III-R classification for cannabis dependence; cannabis use in previous 30 days
Copeland 2001[53] (Australia, voluntary)	CBT (6); MI (1); wait list	229	≥ 18	32 (NR)	High use: DSM-IV cannabis dependence
de Dios 2012[43] (USA, voluntary)	MI/meditation (2); AO	39	18–29	23 (NR)	Low use: ≥ 3 times past month
Fernandes 2010[62] (Brazil, voluntary)	Tele-brief motivational intervention (1) written cannabis information	1744	NR	25 (11–NR)	NR
Fischer 2012[75] and Fischer 2013[64] (Canada, voluntary)	Brief MI (1); written cannabis information; therapist general health MI (1); written general health information	134	18–28	20 (NR)	Low use: used for > 1 year, at least 12 of past 30 days
Gates 2012[55] (Australia, voluntary)	Tele-CBT/MI (4); wait list	160	≥ 16	36 (NR)	Low use: ≥ 1 use cannabis in last month
Gmel 2013[67] (Switzerland, voluntary)	Brief MI (1); AO	378	19–20	20 (19–20)	NR
Grenyer 1997[56] (Australia, NR)	SEDP (16); MI (1)	40	NR	34 (NR)	High use: DSM-IV cannabis dependence
Hoch 2014[60] (Germany, referral)	CBT/MET/PPS (10); wait list	385	≥ 16	27 (16–63)	Low use: ≥ 9 days/month
Hoch 2012[59] and Hoch 2008[76] (Germany, voluntary and referral)	CBT/MET/PPS (10); wait list	122	≥ 16	24 (16–44)	High use: DSM-IV cannabis dependence/ abuse 89%
Humeniuk 2012[71] (worldwide, referral)	Brief MI (1); wait list	395	16–62	31 (NR)	NR

Mean cannabis use at BL	Additional exclusion criteria	Mean alcohol and tobacco use at BL	Key outcomes			
			Cannabis use	Severity of dependence	Cannabis-related problems	Session attendance
27 days/month	Psychiatric conditions; other drug use	Total drinks in last 90 days: 47–59	Yes	Yes	Yes	Yes
NR	Other drug use	NR	Yes			
26 days/month	Psychiatric conditions; other drug use	Mean days alcohol use in past 30 days = 6–8 days	Yes		Yes	Yes
23 days/month	Psychiatric conditions; other drug use	Days of alcohol use past 30 days: 2.7–7.0 days	Yes	Yes	Yes	Yes
NR	Other drug use	NR	Yes	Yes	Yes	Yes
18 days/month	Psychiatric conditions; other drug use	NR	Yes			Yes
NR	NR	NR	Yes			
24 days/month	NR	NR	Yes			
NR	Psychiatric conditions; other drug use	Nicotine 90-day use: 57.6–59. Alcohol: 90-day use: 20.1–25.9	Yes	Yes	Yes	Yes
7–9 days/month	NR	NR	Yes			
NR	Other drug use	NR	Yes	Yes		
20 days/month	Psychiatric conditions; other drug use	Alcohol: mean 0.2 litres/day. Tobacco: 78–82% used daily	Yes	Yes	Yes	Yes
NR	Psychiatric conditions; other drug use	Alcohol dependence: 30%	Yes	Yes		Yes
NR	NR	NR	Yes			

continued

TABLE 1 Characteristics of included studies: general population studies (*continued*)

Study (country, mode of recruitment)	Interventions (number of sessions)	Number of cannabis users	Inclusion criteria: age (years)	Mean age at BL (years) (range)	Level of cannabis use/dependence[a]
Jungerman 2007[63] (Brazil, NR)	CBT/MI/RP (4) (3 months); CBT/MI/RP (4) (1 month); wait list	160	≥ 18	32 (18–58)	Low use: ≥ 13 days/month
Kadden 2007[44] and Litt 2008[77] (USA, voluntary)	CBT/MET (9); CaseM (9); CBT/MET/vouchers (9); vouchers	240	≥ 18	33 (NR)	High use: DSM-IV cannabis dependence
Lee 2013[46] (USA, referral)	Brief MI (1); AO	212	18–25	20 (NR)	Low use: ≥ 5 days/month
Lee 2010[45] (USA, referral)	Internet-based personalised feedback (1); AO	341	17–19	18 (NR)	Low use: any use
Litt 2013[47] (USA, voluntary)	CBT/MET/vouchers (homework) (9); CBT/MET/vouchers (abstinence) (9); CaseM (9)	215	≥ 18	33 (NR)	High use: DSM-IV cannabis dependence
Rooke 2013[70] (worldwide, voluntary)	Internet-based CBT/MI (6); internet-based written cannabis information	230	≥ 18	31 (NR)	Low use: ≥ 1 day/month
Sobell 2009[65] (Canada, voluntary and referral)	CBT/MI (4) (group); CBT/MI (4) (individual)	17	≥ 18	32 (NR)	Low use: 'not severe dependence'
Stein 2011[48] (USA, voluntary)	MI (2); AO	332	18–24	21 (NR)	Low use: ≥ 1 day/month
Stephens 2007[51] (USA, voluntary)	MI/personalised feedback (1); cannabis education (1); wait list	188	≥ 18	32 (18–57)	High use: ≥ 15 days/month
Stephens 2000,[50] Lozano 2006[78] and DeMarce 2005[79] (USA, voluntary)	CBT/RP/social support (14); MI (2); wait list	291	≥ 18	34 (NR)	High use: DSM-III-R cannabis dependence
Stephens 1994[49] (USA, voluntary)	CBT/RP (10); social support group (10)	212	≥ 18	32 (18–65)	High use: ≥ 17 days/month
Tossmann 2011[61] (Germany, voluntary)	Internet-based counselling; wait list	1292	NR	25 (NR)	High use: 'any use', 92% DSM-IV cannabis dependent at BL

AO, assessment only; BL, baseline; CaseM, case management; DSM-III-R, *Diagnostic and Statistical Manual of Mental Disorders* Three (Revised); MET + brief therapist + voucher, MET plus brief plus contingency management; NR, not reported; PPS, psychosocial problem-solving; RP, relapse prevention; SEDP, supportive–expressive dynamic psychotherapy; tele-CBT, telephone-delivered CBT.

a Level of cannabis use/dependence was classified as follows: 'high use': ≥ 80% of participants met DSM or *International Classification of Diseases* 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. Anything else defined as 'low use'.

Mean cannabis use at BL	Additional exclusion criteria	Mean alcohol and tobacco use at BL	Key outcomes			
			Cannabis use	Severity of dependence	Cannabis-related problems	Session attendance
26–28 days/month	Psychiatric conditions; other drug use	Alcohol: 10–11% of prior 90 days	Yes	Yes	Yes	Yes
NR	Psychiatric conditions; other drug use	ASI alcohol score 0.10	Yes	Yes	Yes	Yes
16–17 days/month	NR	NR	Yes		Yes	Yes
3 days/month	NR	NR	Yes		Yes	
24 days/month	Psychiatric conditions; other drug use	NR	Yes		Yes	Yes
21 days/month	Psychiatric conditions; other drug use	NR	Yes	Yes		Yes
27 days/month	Psychiatric conditions; other drug use	NR	Yes			
17 days/month	Other drug use	NR	Yes			Yes
26 days/month	Psychiatric conditions; other drug use	Alcohol use on 1.8 days per week	Yes	Yes	Yes	Yes
25 days/month	Psychiatric conditions; other drug use	NR	Yes	Yes	Yes	Yes
27 days/month	Psychiatric conditions; other drug use	NR	Yes		Yes	Yes
NR	NR	NR	Yes			Yes

TABLE 2 Characteristics of included studies: psychiatric population studies

Study (country, mode of recruitment)	Interventions (number of sessions)	Number of cannabis users	Inclusion criteria: age (years)	Mean age at BL (years) (range)	Level of cannabis use/dependence[a]
Baker 2006[52] (Australia, referral)	CBT/MI + TAU (10); TAU	73	≥ 15	29 (15–61)	Low use: ≥ 4 days/month
Bonsack 2011[66] (Switzerland, referral)	CBT/MI + TAU (6); TAU	62	18–35	26 (18–35)	High use: 82% cannabis dependent
Edwards 2006[54] (Australia, referral)	CBT/MI + TAU (10); psychoeducation (non-cannabis) + TAU (10)	47	15–29	21 (NR)	Low use: 49% DSM-IV cannabis dependent
Hjorthoj 2013[68] and 2012[80] (Denmark, referral)	CBT/MI + TAU (24); TAU	103	17–42	27 (NR)	High use: ICD-10 cannabis dependence/ abuse
Kay-Lambkin 2011[58] (Australia, voluntary and referral)	CBT/MI (10); computer-delivered CBT/MI + brief therapist (10); PCT (10)	109	≥ 16	40 (17–70)	Low use: ≥ 4 days/month
Kay-Lambkin 2009[57] (Australia, voluntary and referral)	CBT/MI (10); computer-delivered CBT/MI + brief therapist (10); brief MI (1)	43	≥ 16	35 (18–61)	Low use: ≥ 4 days/month
Madigan 2013[69] (Ireland, voluntary and referral)	CBT/MI (group) (12); TAU	88	16–65	28 (NR)	High use: DSM-IV cannabis dependence

BDI-II, Beck Depression Inventory II; BL, baseline; PCT, person-centred therapy.

a Level of cannabis use/dependence was classified as follows: 'high use': ≥ 80% of participants met DSM or *International Classification of Diseases* 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.

Mean cannabis use at BL	Inclusion criteria: psychiatric condition	Additional exclusion criteria	Mean alcohol and tobacco use at BL	Key outcomes			
				Cannabis use	Severity of dependence	Cannabis-related problems	Session attendance
5–8 days/month	ICD-10 psychotic disorder	NR	NR	Yes			Yes
23 days/month	ICD-10 psychotic disorder	Other drug use	NR	Yes		Yes	Yes
8 days/month	DSM-IV psychotic disorder	NR	2.2% DSM-IV diagnosed alcohol dependence	Yes	Yes		Yes
15 days/month	ICD-10 schizophrenia	NR	NR	Yes			Yes
NR	DSM-IV major depressive disorder, BDI-II ≥ 17	Psychotic conditions	NR	Yes			Yes
NR	DSM-IV major depressive disorder, BDI-II ≥ 17	NR	NR	Yes			Yes
NR	DSM-IV schizophrenia, psychosis, major depressive or bipolar disorder	NR	NR	Yes			Yes

Population

General or psychiatric

The included studies can be broadly categorised into those that sought to treat the 'general cannabis users population' (26 studies;[39–51,53,55,56,59–63,65,67,70,71,75] see *Table 1*) and those that sought to treat patients with a 'dual diagnosis' (patients with both a psychiatric condition and cannabis use, seven studies;[52,54,57,58,66,68,69] see *Table 2*). Among the psychiatric studies, two studies[52,66] included participants with schizophrenia, psychosis or bipolar disorder (via ICD-10 criteria), one study[68] included those with schizophrenia spectrum diagnosis (via ICD-10 criteria), two studies[54,69] included those with psychosis (via DSM-IV criteria) and two studies[57,58] included those with major depressive disorder (via DSM-IV criteria and a score $\geq$ 17 on the Beck Depression Inventory II).

The included studies recruited a total of 8168 participants; 7643 were involved in general population studies, whereas 525 were recruited into the psychiatric studies (participant numbers were not reported in one study,[52] in which the participant numbers at follow-up were used to calculate total number of participants). The studies of the former grouping tended to restrict the inclusion of patients, with 15 studies[39–41,43,44,47,49–51,55,59,60,63,65,70] excluding patients with a psychiatric condition and other drug dependencies and four studies[42,48,53,56] excluding only patients with other drug dependencies. One psychiatric study excluded participants who had other drug dependences.[66]

Recruitment

In order to recruit participants, the studies treating the general population most frequently used voluntary recruitment methods, that is, participants responded to advertisements (16 studies[40,42–44,47–51,53,55,61,62,67,70,75]), with fewer studies employing a referral mechanism (four studies[45,46,60,71]) or a combination of voluntary recruitment and referrals (four studies[39,41,59,65]); recruitment methods could not be ascertained for two studies.[56,63] Conversely, the psychiatric studies all employed referral mechanisms (four studies[52,54,66,68]) or a combination of referral and voluntary recruitment methods (three studies[57,58,69]). Therefore, the 'general population' studies mostly involved self-selected participants who may have been more motivated to cease use than the average cannabis user.

Age

The majority of studies employed participant age study inclusion criteria, bar three.[56,61,62] Participants were included if they were aged 18–19 years or over (19 studies[39–44,46–51,53,63,65–67,70,75]), aged 16–17 years or over (nine studies[45,55,57–60,68,69,71]) or aged 15 years or over (two studies[52,54]). Twelve studies also included an upper age limit; this was in the twenties (six studies[43,46,48,54,67,75]), thirties to forties (two studies[66,68]) or sixties (three studies[42,69,71]), while one study used an age range of 17–19 years[45] and one used a range of 19–20 years.[67] At baseline, the mean age of participants across studies was 29 years (all studies, range for mean age 18–40 years, median 32 years; general population studies, range 18–36 years, median 32 years; psychiatric studies, range 21–40 years, median 28 years).

Cannabis use or dependence at baseline

Thirty of the included studies specified criteria for the level of cannabis use at study inclusion.[39–61,63,65,66,68,69,70,75] These criteria varied by study, with eight studies[44,47,53,56,65,68,69,71] utilising dichotomous criteria [patients meeting the DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders* Three (Revised) (DSM-III-R) or ICD-10 criteria for cannabis dependence or cannabis abuse], 18 studies[43,45,46,48–52,54,55,57–60,63,66,70,75] selecting an inclusion point on a continuous scale of cannabis use (ranging from 1 to 20 or more days of use of cannabis per month) and four studies[39–42] using a combination of both. Therefore, we classified studies into those for which the inclusion criteria for cannabis use or dependence were deemed to be 'low' and those for which they were deemed to be 'high'. 'High use' was defined as a study inclusion criterion or population baseline measurement in which $\geq$ 80% of participants met the DSM or *International Classification of Diseases* criteria for cannabis dependence or abuse, and/or an inclusion criterion specifying that all participants used cannabis on at least 50% of days over a specified time period. Thirteen studies treating the general population included participants with 'high' use[39–42,44,47,49–51,53,56,59,61] and 10 with 'low' use,[43,45,46,48,55,60,63,65,70,75]

and baseline use could not be determined for three studies.[62,67,71] Of those treating the psychiatric population, three studies[66,68,69] included only participants with high use, whereas four[52,54,57,58] included low-use participants.

Other substance use

Participants' use of other substances at baseline was seldom reported by the studies; studies that did report this did not do so in a consistent manner. Overall, 10 studies reported alcohol use at baseline[39–41,44,51,54,55,59,60,63] and two also reported tobacco use;[55,60] the remaining 23 studies did not report this baseline measurement. Of the studies reporting alcohol use, five reported the average proportion of participants' drinking days over a specified period,[40,41,55,63,66] two reported average drinks per day over a specified period,[51,60] two reported the proportion of participants who were deemed to meet the DSM criteria for alcohol dependence[54,59] and one reported participants' ASI score.[39]

Comparators

Of the 26 'general population' studies, 11 tested two or more interventions (with no inactive control arm, although some included an active control such as education),[40–42,44,47,49,56,62,65,70,75] 10 tested a single intervention against an inactive control [wait list or assessment only (AO)][43,45,46,48,55,59–61,67,71] and five tested more than one active intervention against an inactive control.[39,50,51,53,63] The general population studies utilised wait list (10 studies[50,51,53,55,59–61,63,71]) or AO (five studies[43,45,46,48,67]) as inactive controls. Of the 'psychiatric' studies, four tested a single intervention against a TAU control[52,66,68,69] and three tested two or more active interventions with no inactive control.[54,57,58] TAU consisted of antipsychotic medication and psychiatric condition monitoring, plus self-help material in one study and a psychosocial intervention in two studies.

Interventions

The included interventions varied considerably. Single interventions consisted of multiple and overlapping components. In the following summary, we have classed studies by their 'main' intervention, which we have defined as either CBT or MI or contingency management. If a study consists of multiple intervention arms or multicomponent interventions consisting of CBT or MI, we have classed the 'main' intervention as CBT. The majority of general population studies (15 studies[39–42,44,47,49,50,53,55,59,60,63,65,70]) evaluated CBT as their main intervention, or a variation thereof. Of the 15 studies, three studies[55,59,60] compared CBT with a wait list control; eight[40–42,44,47,49,65,70] compared CBT with MI, a variation of CBT or another intervention; and four[39,50,53,63] compared CBT with both a wait list control arm and another arm consisting of MI, a variation of CBT or another intervention. Five of the 15 studies also assessed contingency management, alone and/or in combination with CBT.[40–42,44,47] Of the 15 studies, 12 assessed the use of therapist-delivered CBT, whereas three[42,55,70] assessed the use of computer- or telephone-delivered treatment (one[42] of which tested therapist-delivered CBT against computer-delivered). Duration of CBT treatment ranged considerably, from 4 weeks[63] to 18[50] weeks. The majority of interventions involved weekly (or near weekly) sessions, with the notable exceptions of Hoch *et al.*[59] (two sessions per week over 5 weeks), one treatment arm of Budney *et al.*[40] (four sessions over 14 weeks) and Babor *et al.*[39] (two arms: nine sessions over 12 weeks and two sessions over 5 weeks). Nine studies assessed the use of a motivational intervention but not CBT;[43,45,46,48,51,62,67,71,75] two[45,62] of these assessed computer- or telephone-delivered treatment. Two general population studies did not involve MI or CBT components; Tossman *et al.*[61] provided internet-based counselling, whereas Grenyer *et al.*[56] provided supportive–expressive dynamic psychotherapy.

The psychiatric population studies evaluated the use of CBT (seven studies).[52,54,57,58,66,68,69] Five studies utilised therapist-delivered interventions,[52,54,66,68,69] the remainder (two studies)[57,58] assessed the use of computer-delivered CBT compared with therapist-delivered CBT. Length of treatment varied: in four studies treatment lasted 10 weeks,[52,54,57,58] in one study 12 weeks[69] and in two studies 24 weeks.[66,68] All CBT sessions were delivered on a weekly basis, with the notable exception of Bonsack *et al.*[66] (four to six sessions over 24 weeks).

No studies were found that assessed the efficacy of mutual aid therapy.

Outcomes

All of the included RCTs measured the effect of the intervention(s) on participants' cannabis use; however, the way in which this was measured varied greatly by study. For example, studies measured point abstinence rates, abstinence over a specified period, frequency of cannabis use per day over a specified period and number of cannabis-using days over a specified period. Thirteen studies[39,40,44,50,51,53–56,59,60,63,70] measured participants' severity of cannabis dependence (measured via self-report using various instruments, most frequently using the SDS or ASI).[11,34] Fifteen studies[39–41,44–47,49–51,53,55,60,63,66] measured participants' number of cannabis-related problems [measured using various instruments, most frequently the Marijuana Problems Scale (MPS)].[35] Twenty-five studies measured participants' use of the intervention or session attendance.[39–41,43,44,47–55,57–61,63,66,68,69,70,77]

Risk of bias in included studies

Table 3 summarises the risk of bias for each of the included studies. Most studies used an appropriately generated randomisation sequence, with 21 studies being deemed 'low risk', 10 'unclear risk' and two 'high risk'. Allocation concealment followed a similar pattern. No studies blinded study participants to group allocation and 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 18 studies, blinding of outcome assessment was unclear or unreported.[40,44–46,49,50,52,55,56,58–63,66,75,81] Participant attrition was well reported but high, ranging from 6% to 79% (mean 30.2%, median 25.5%); 22 studies were rated as high risk for this attribute (with attrition of > 20% at the final follow-up time point). Regarding overall risk, 24 studies[40,41,43,48,49,52–55,57–63,65,67–69,70,71,75,81] were deemed to be 'high risk', in nine studies[39,44–47,50,51,56,66] the risk was unclear and no studies were deemed to be 'low risk'. In the general population subgroup, 18 studies[40,41,43,48,49,53,55,59–62,63,65,67,70,71,75,81] were deemed to be at high risk of bias, whereas in eight studies[39,44–47,50,51,56] the risk was unclear. In the psychiatric population studies, six[52,54,57,58,68,69] were deemed to be at high risk and in one study[66] the risk was unclear. Twenty-one of the studies[40,41,43,48,49,53–55,57–63,65,67–69,75,81] were deemed to be at high risk owing to incomplete outcome data (high level of attrition) and three studies[52,70,71] were deemed to be at high risk owing to poor random sequence generation or allocation concealment.

Assessment of effectiveness

Overview of effectiveness section

Results are presented for each intervention/comparator category (e.g. CBT vs. wait list, CBT vs. brief MI, etc.). An overall summary of results is provided in *Tables 4* and *5*. This is followed by more detailed results for each intervention/comparator category (see *Tables 6–23*). Owing to the large number of studies and the variability in outcomes and data format, detailed numerical results are not presented here. Instead, this section provides an overview of the outcomes reported per study and how many showed a significant difference, both between intervention groups and in terms of changes from baseline, at different follow-up time points. Full extracted data per study are provided in *Appendix 4*.

Outcomes reported

Outcomes reported in most studies could be classified into four main groups: cannabis use, severity of dependence, cannabis-related problems and level of attendance or compliance with the intervention(s). Cannabis use outcomes included point abstinence rates, abstinence over a specified period, number of days using cannabis or number of days abstinent (over a specified period), amount of cannabis use per day and number of periods of use per day (e.g. of four daily periods). For session attendance, seven studies[41,44,47,49,54,57,58] reported significance levels between study groups; this was non-significant in all cases.

TABLE 3 Risk of bias in included studies

Author and year	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data (% attrition)[a]	Selective reporting	Overall risk[b]
Babor 2004[39] and Litt 2005[72]	Low risk	Unclear risk	Not possible	High risk	Intermediate risk (17)	Low risk	Unclear risk
Baker 2006[52]	High risk	High risk	Not possible	Unclear risk	Intermediate risk (20)	Low risk	High risk
Bonsack 2011[66]	Low risk	Low risk	Not possible	Unclear risk	Intermediate risk (13)	Low risk	Unclear risk
Budney 2011[81] and ClinicalTrials.gov 2013[73]	Unclear risk	Unclear risk	Not possible	Unclear risk	High risk (39)	Unclear risk	High risk
Budney 2006[41]	Low risk	Unclear risk	Not possible	High risk	High risk (28)	Low risk	High risk
Budney 2000[40] and Moore 2003[74]	Low risk	Unclear risk	Not possible	Unclear risk	High risk (25)	Low risk	High risk
Copeland 2001[53]	Unclear risk	Low risk	Not possible	Low risk	High risk (26)	Low risk	High risk
de Dios 2012[43]	Unclear risk	Low risk	Not possible	Low risk	High risk (27)	Low risk	High risk
Edwards 2006[54]	Low risk	Low risk	Not possible	Low risk	High risk (30)	Low risk	High risk
Fernandes 2010[62]	Low risk	Unclear risk	Not possible	Unclear risk	High risk (70)	Low risk	High risk
Fischer 2012[75] and Fischer 2013[64]	Unclear risk	Unclear risk	Not possible	Unclear risk	High risk (46)	Low risk	High risk
Gates 2012[55]	Low risk	Unclear risk	Not possible	Unclear risk	High risk (31)	Low risk	High risk
Gmel 2013[67]	Low risk	Low risk	Not possible	Low risk	High risk (21)	Low risk	High risk
Grenyer 1997[56]	Unclear risk	Unclear risk	Unclear risk	Unclear risk	Unreported	Unclear risk	Unclear risk
Hjorthoj 2013[68] and Hjorthoj 2012[80]	Low risk	Low risk	Not possible	Low risk	High risk (34)	Low risk	High risk
Hoch 2014[60]	Low risk	Low risk	Not possible	Unclear risk	High risk (79)	Low risk	High risk
Hoch 2012[59] and Hoch 2008[76]	Low risk	Low risk	Not possible	Unclear risk	High risk (27)	High risk	High risk
Humeniuk 2012[71]	Low risk	High risk	Not possible	High risk	Intermediate risk (14)	Low risk	High risk

continued

TABLE 3 Risk of bias in included studies (*continued*)

Author and year	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data (% attrition)[a]	Selective reporting	Overall risk[b]
Jungerman 2007[63]	Low risk	Low risk	Not possible	Unclear risk	High risk (38)	Low risk	High risk
Kadden 2007[44] and Litt 2008[77]	Low risk	Low risk	Not possible	Unclear risk	Intermediate risk (17)	Low risk	Unclear risk
Kay-Lambkin 2011[58]	Unclear risk	Unclear risk	Not possible	Unclear risk	High risk (41)	Low risk	High risk
Kay-Lambkin 2009[57]	Unclear risk	Low risk	Not possible	Low risk	High risk (24)	Low risk	High risk
Lee 2013[46]	Low risk	Low risk	Not possible	Unclear risk	Intermediate risk (17)	Low risk	Unclear risk
Lee 2010[45]	Low risk	Low risk	Not possible	Unclear risk	Intermediate risk (6)	Low risk	Unclear risk
Litt 2013[47]	Low risk	Low risk	Not possible	High risk	Intermediate risk (15)	Low risk	Unclear risk
Madigan 2013[69]	Low risk	Unclear risk	Not possible	Low risk	High risk (42)	Low risk	High risk
Rooke 2013[70]	High risk	High risk	Not possible	Low risk	High risk (46)	Low risk	High risk
Sobell 2009[65]	Low risk	Unclear risk	Not possible	Low risk	High risk (21)	Low risk	High risk
Stein 2011[48]	Unclear risk	Unclear risk	Not possible	Low risk	High risk (21)	Low risk	High risk
Stephens 2007[51]	Low risk	Low risk	Not possible	High risk	Intermediate risk (17)	Low risk	Unclear risk
Stephens 2000,[50] Lozano 2006[78] and DeMarce 2005[79]	Unclear risk	Low risk	Not possible	Unclear risk	Intermediate risk (10)	Low risk	Unclear risk
Stephens 1994[49]	Unclear risk	Unclear risk	Not possible	Unclear risk	High risk (21)	Low risk	High risk
Tossmann 2011[61]	Low risk	Low risk	Not possible	Unclear risk	High risk (84)	Low risk	High risk

a Low risk, up to 5% attrition; intermediate risk, ≥ 5–20%; high risk, > 20% attrition; unclear risk, unreported.
b Overall risk: low risk – randomisation method, allocation concealment, blinded outcome assessment and incomplete data, all 'low risk'; high risk – inadequate randomisation (self-selection, sequential patients odd and even), in such trials allocation will probably not be concealed, and/or allocation not concealed, and/or incomplete outcome data 'high risk'.

TABLE 4 Overall summary of results (general population)

Comparison	Number of studies, number randomised (number of patients followed up), cannabis use categorisation high *n*, low *n*	Intervention (*n* sessions)	Computer (*n* sessions)	Individual or group, duration	Key findings
CBT vs. wait list	Six studies,[39,50,53,59,60,63] *n* = 1265 (997), high 4, low 2	CBT (4–14 sessions)	Wait list	Five individual/one group, 5–18 weeks	CBT (4–14) significantly better than wait list: post treatment (five of five studies with data[39,50,59,60,63]) and at 9 months (one of one study[39]). Significant change from baseline: CBT, post treatment (four of four studies[39,50,59,60]) and at 6–9 months (three of three studies[39,59,60]). Wait list, post treatment (two of two studies[59,60])
CBT vs. brief MI	Four studies,[39,40,50,53] *n* = 707 (581), high 4	CBT (6–14 sessions)	MI/MET (1–4 sessions)	Three individual/one both, 6–18 weeks	CBT (6–14) vs. MI (one to four): mixed results. Of four studies, two studies[40,50] showed CBT better on some outcomes while two studies[39,53] showed few between-group differences (post treatment and at 9–16 months). Significant change from baseline: CBT and MI, post treatment (three studies[39,40,50]) and 9–16 months (two studies[39,53])
SEDP vs. brief MI	One study,[56] *n* = 40 (40), high 1	SEDP (16 sessions)	MI (1 session)	NR, NR	SEDP (16 sessions) significantly better than MI (1 session): post treatment (one study,[56] limited outcomes)
CBT vs. other	Four studies,[44,49,63,65] *n* = 462 (365), high 2, low 2	CBT (4–10 sessions)	Various	Two individual/one group/one both, 4–12 weeks	CBT vs. social support group or case management: no significant difference, post treatment or 14–15 months (two of two studies[49,77]). Significant change from baseline, all groups, post treatment and 14–15 months (two of two studies[44,49]). Group vs. individual: one small study[65] favours individual vs. group CBT-4 (limited data)
Computer-/ tele-CBT vs. other	Three studies,[55,61,70] *n* = 1682 (481), high 1,[61] low 2	Computer-/ tele-CBT (4–6 sessions)	Wait list or education	Three individual, 3–7 weeks	Tele-CBT significantly better than wait list: most outcomes, post treatment and at 3 months (one of one study[55]). Internet-delivered CBT/counselling significantly better than wait list/ education: most outcomes at 3 months (two of two studies[61,70]). Significant change from baseline: all groups, post treatment and at 3 months (two of two studies[55,70])

continued

TABLE 4 Overall summary of results (general population) (*continued*)

Comparison	Number of studies, number randomised (number of patients followed up), cannabis use categorisation high *n*, low *n*	Intervention (*n* sessions)	Computer (*n* sessions)	Individual or group, duration	Key findings
Brief MI vs. wait list or AO	10 studies,[39,43,45,46,48,50,51,53,67,71] $n = 2437$ (2288), high 4, low 6	MET/MI (1 or 2 sessions)	Wait list or AO	Nine individual/one group, 1–5 weeks	Brief MI vs. wait list/AO: some significant differences. Brief MI significantly better on some outcomes but not all, post treatment (five of five studies[39,43,48,50,51]) and at 3–9 months (seven of seven studies[43,45,46,48,53,67,71]). Significant change from baseline: post treatment and at 3–6 months, brief MI (two of two studies[39,48]), wait list/AO (two of two studies[48,71])
Brief MI vs. other	Three studies,[51,62,75] $n = 2002$ (754), high 1, low 2	MI or tele-MI (1 session)	Cannabis or health education	Three individual, 1 week	Brief MI vs. other: mixed results, limited data. Brief MI better than education control on some but not all outcomes, post treatment (one of one study[51]) and at 3–12 months (two[51,62] of three studies[51,62,70]). Significant change from baseline: brief MI and education control at 3 months (one of one study[75])
Contingency management vs. other	Five studies,[40–42,44,47] $n = 680$ (581), high 5	Voucher (abstinence), CBT + voucher	CBT (9–14 sessions), MET (2–4 sessions), other	Five individual, 8–14 weeks	Post treatment: CBT + voucher or voucher alone better than CBT or MET (three of three studies[40,42,44]). Maintained for CBT + voucher, not voucher alone: CBT + voucher better than CBT or voucher at 14–15 months (two of two studies[41,44]). Significant change from baseline: all groups post treatment and at 14–15 months (three of three studies[41,44,47])

CBT + voucher, CBT plus voucher incentives; SEDP, supportive–expressive dynamic psychotherapy; tele-CBT, telephone-delivered CBT; tele-MI, telephone-delivered MI.

TABLE 5 Overall summary of results (psychiatric population)

Comparison	Number of studies, number randomised (number of patients followed up), cannabis use categorisation high *n*, low *n*	Intervention (*n* sessions)	Computer (*n* sessions)	Individual or group, duration	Key findings
CBT + TAU vs. TAU	Four studies,[52,66,68,69] *n* = 326 (254), high 3, low 1	CBT (6–24 sessions) + TAU	TAU	Three individual/one group, 10–26 weeks	CBT + TAU vs. TAU: few significant differences post treatment. No significant difference at 10–12 months (four of four small studies,[52,66,68,69] limited data). Little significant change from baseline: no change (two studies[52,69]), change on one outcome in both groups (one study[66]), post treatment and at 12 months
CBT vs. other	Three studies,[54,57,58] *n* = 199 (197), low 3	CBT or computer-delivered CBT (10 sessions)	Education (10 sessions), CBT (10 sessions), PCT (10 sessions), brief MI (1 session)	Three individual, 10–12 weeks	CBT vs. psychoeducation (10 sessions): no significant difference post treatment or at 9 months; both groups improved from baseline (one study,[54] limited data). Computer-based CBT vs. CBT or PCT (10 sessions): no significant difference post treatment; (one study,[58] limited data). Computer-based CBT or CBT (10 sessions) better than brief MI (1 session) at 12 months; all improved from baseline (one study,[57] limited data)

PCT, person-centred therapy.

Subgroup analyses: effect of intervention and population characteristics

The effect of intervention and population characteristics on results was also examined to assess whether or not any patterns could be observed in terms of which studies showed positive results. Findings are described within each intervention/comparator category and an overview provided in *Subgroup analyses: effect of intervention and population characteristic*.

Studies in general population of cannabis users

Cognitive–behavioural therapy compared with wait list control

Description of studies

Six studies[39,50,53,59,60,63] ($n = 1265$ randomised, 997 followed up) compared CBT (4–14 sessions) with wait list control (*Tables 6* and *7*). Session attendance ranged from 60% to 72% (not reported in three studies[59,60,63]). Five studies[39,53,59,60,63] provided individual CBT sessions and one[50] provided group sessions. CBT interventions also incorporated other strategies including case management (one study),[39] psychosocial problem-solving (two studies)[59,60] and a social support group (one study).[50] Participants were classified as having high baseline use/dependence in four studies[39,50,53,59] and low use/dependence in two studies.[60,63] Two studies were conducted in the USA,[39,50] two in Germany,[59,60] one in Australia[53] and one in Brazil.[63]

Main results

Five studies[39,50,59,60,63] reported post-treatment (5–18 weeks) outcomes. All five reported significantly better results for CBT (4–14 sessions) than for wait list on most outcomes, including cannabis use (significant in all five studies), severity of dependence (significant in four[39,50,59,60] out of five studies) and cannabis problems (significant in three[39,50,60] out of four studies[39,50,59,60] reporting this). In addition, four studies[39,50,59,60] reported change from baseline to post treatment; all four reported significant improvements from baseline on most outcomes, for the CBT groups (two studies[39,59]) or for both the CBT and wait list groups (two studies[50,60]). Effect sizes at 12 weeks (based on data from two studies[39,60]) ranged from 0.4 to 1.1 for cannabis use outcomes and from 0.9 to 1.6 for severity of dependence.

Only one study[53] reported between-group data at a later follow-up point than post treatment (because, in most studies with a wait list comparison, the wait list group began treatment when other groups completed theirs and so could not be followed for longer). This study reported significantly better results for CBT (6 sessions) than wait list on most outcomes at 9 months post baseline (7.5 months after end of treatment), including cannabis use, severity of dependence and cannabis problems. Three studies[39,59,60] reported significant improvements from baseline to 6 months (two studies[59,60]) or 9 months (one study[39]), for the CBT group (wait list groups were not followed for this long).

Effects of intervention characteristics

All six studies reported mainly positive findings so there were no clear differences in results according to population or intervention differences.[39,50,53,59,60,63] All durations of CBT (4–14 sessions) appeared effective; there were slightly fewer significant effects in the study of four-session CBT,[63] but this may have been owing to the smaller number of participants in this study. The one study of group CBT[50] (14 sessions) had similar positive outcomes to the individual CBT studies.

Effects of population characteristics

In terms of baseline cannabis use/dependence, three studies classed as high use[39,50,59] all showed significant effects post treatment, while of the two studies classed as low use, one[60] showed significant effects on all outcomes and the other[63] on some but not all outcomes. This may indicate slightly less effectiveness in participants with lower baseline use, or may be simply a result of the smaller number of participants in the latter study.[63] Two studies[50,53] used voluntary recruitment, one[60] used referrals, and two[39,59] used a combination (for one[63] this was not reported); all studies showed significant effects regardless of recruitment method. Mean age ranged from 24 years to 36 years and there were no clear differences in effects according to age.

TABLE 6 Summary for CBT compared with wait list (general population)

Comparison	Number of studies, number randomised (number followed up), categorisation high *n*, low *n*	Intervention (*n* sessions)	Computer (*n* sessions)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
CBT vs. wait list	Six studies[39,50,53,59,60,63] (see *Table 7*), *n* = 1265 (997), high 4,[39,50,53,59] low 2[60,63]	CBT (4–14 sessions), some CBT included: CaseM (1), PPS (2), social support (1)	Wait list	Five individual, one group, 5–18 weeks	Significant difference: five studies:[39,50,59,60,63] CBT significantly better than wait list on most outcomes: • Cannabis use (five of five studies) • Severity of dependence (four[39,50,59,60] of five studies) • Cannabis problems (three[39,50,60] of four studies)	Significant change: four studies:[39,50,59,60] significant improvement baseline to post treatment on most outcomes, CBT group (two studies[39,50]) or both groups (two studies[59,60])	6–9 months	Significant difference: one study:[53] CBT-6 significantly better than wait list on most outcomes at 9 months: • Cannabis use • Severity of dependence • Cannabis problems	Significant change: three studies:[39,59,60] significant improvements on most outcomes in CBT group from baseline to 6 months (two studies[59,60]) or to 9 months (one study[39])

CaseM, case management; CBT-6, six-session CBT; PPS, psychosocial problem-solving.

TABLE 7 Results per study for CBT vs. wait list (general population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Babor 2004[39] and Litt 2005[72] (MTP), USA, high use (DSM-IV 100%), voluntary + referral, 36 years (18–62 years)	CBT/MET/CaseM (9) (6.5), $n = 156$ (133)	Wait list, $n = 148$ (137)	Individual, 12 weeks	Significant difference: • Days used ($d = 1.14$) • % abstinent • Joints per day ($d = 0.43$) • Periods use per day ($d = 0.91$) • Dependence symptoms (DSM-IV) ($d = 0.9$) • Abuse symptoms (DSM-IV) ($d = 0.63$) • Cannabis problems (MPS) (p-values NR)	Significant change: • All outcomes (CBT)	9 months		Significant change: • All outcomes (CBT)
Copeland 2001,[53] Australia, high use (DSM-IV 96%), voluntary, 32 years (≥ 18 years)	CBT (6) (4.2), $n = 78$ (58)	Wait list, $n = 69$ (51)	Individual, 6 weeks			9 months	Significant difference: • % abstinent, $p = 0.05$ • Amount per day, $p = 0.02$ • SDS, $p < 0.001$ • Cannabis problems (CPQ), $p < 0.001$ No significant difference: • Days abstinent, $p =$ NS	

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Hoch 2014[60] (CANDIS-II), Germany, low use (ICD-10 56%), referral, 27 years (16–63 years)	CBT/MET/PPS (10) (NR), $n = 255$ (166)	Wait list, $n = 130$ (106)	Individual, 12 weeks	Significant difference: • % abstinent • Amount per week • SDS ($d = -0.6$, 95% CI −1.2 to 0.2) • Number of dependence symptoms ($d = -0.9$, 95% CI −1.1 to −0.5) • Cannabis problems (CPQ) ($d = -0.7$, 95% CI −1.3 to 0.2) • Cannabis problems (CUPIT) (All $p < 0.001$) ($d = -0.7$, 95% CI −2.9 to 2.1)	Significant change: • % abstinent • Amount per week • Severity dependence • Number of dependence symptoms • Cannabis problems (All groups except amount/week, CBT only)	6 months		Significant change: • % abstinent • Amount per week • Severity dependence • Number of dependence symptoms • Cannabis problems (Data for CBT only)
Hoch 2012[59] and Hoch 2008[76] (CANDIS), Germany, high use (DSM-IV 89%), voluntary + referral, 24 years (16–44 years)	CBT/MET/PPS (10) (NR), $n = 90$ (79)	Wait list, $n = 32$ (31)	Individual, 5–8 weeks	Significant difference: • % abstinent, $p < 0.01$ • Amount per week, $p = 0.008$ • Severity of dependence (ASI), $p < 0.001$ ($d = -1.58$)	Significant change: • Amount per week, $p = 0.001$ (CBT), $p = 0.516$ (wait list) • Severity dependence, $p < 0.001$ (CBT), $p = 0.002$ (wait)	6 months		Significant change: • Amount per week, $p = 0.015$ • Severity of dependence, $p < 0.001$ (data for CBT only)

continued

TABLE 7 Results per study for CBT vs. wait list (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Jungerman 2007, 63 Brazil, low use (≥ 13 day/month), NR, 32 years (18–58 years)	CBT/MI/RP (4) (NR), $n = 52$ (27)	Wait list, $n = 52$ (35)	Individual, 12 weeks	Significant difference: • Days used, $p = 0.0002$ • Periods use per day, $p = 0.004$ • Joints per day, $p = 0.005$ • Dependence symptoms (DSM-III), $p = 0.018$ No significant difference: • Severity of dependence (ASI), $p = 0.292$ • Cannabis problems (MPS), $p = 0.16$				
Stephens 2000,[50] Lozano 2006[78] and DeMarce 2005,[79] USA, high use (DSM-III-R 98%), voluntary, 34 years (≥ 18 years)	CBT/RP/social support group (14) (8.4), $n = 117$ (95)	Wait list, $n = 86$ (79)	Group, 18 weeks	Significant difference: • Days used, $p < 0.001$ • Periods use per day, $p < 0.001$ • % abstinent, $p < 0.001$ • Number of dependence symptoms (MDS), $p < 0.001$ • Cannabis problems, $p < 0.001$	Significant change: • All outcomes ($p < 0.001$, all groups)			

CANDIS, CANnabis DISorders; CaseM, case management; CUPIT, The Cannabis Use Problems Identification Test; MTP, Marijuana Treatment Project; NR, not reported; NS, not significant; PPS, psychosocial problem-solving; RP, relapse prevention.

Cognitive–behavioural therapy or psychotherapy compared with brief motivational interviewing

Description of studies

Four studies[39,40,50,53] ($n = 707$ randomised, 581 followed up) compared CBT (6–14 sessions) with brief MI/MET (1–4 sessions) (*Tables 8* and *9*). Three studies[39,40,53] provided individual CBT sessions, whereas one[50] compared group CBT with individual MET. CBT interventions also included case management (one study)[39] and a social support group (one study).[50] One further study, reported only in abstract form, compared supportive–expressive dynamic psychotherapy (16 sessions, not reported whether individual or group) with brief MI (1 session).[56] Attendance within the CBT or psychotherapy arm of the studies ranged from 60% to 72% (not reported in two studies[40,56]). Owing to the brief nature of the MI arms, only one study[39] reported attendance for this intervention (mean 1.6 sessions attended from a total of 2). Participants were classified as having high baseline use in all five studies. Three studies were conducted in the USA[39,40,50] and two in Australia.[53,56]

Main results

Overall, the comparison of longer durations of CBT with brief MI/MET showed mixed results; however, both interventions provided improvements from baseline. Three CBT studies reported between-group data post treatment (at 12–18 weeks).[39,40,50] Of these, one study[39] reported that nine-session CBT was significantly better than two-session MET on most outcomes (including cannabis use, dependence and problems). Conversely, two studies[40,50] reported no significant difference on any outcomes between CBT (14 sessions) and MET (2 or 4 sessions), although one study[40] involved few participants, which may impact on significance levels. Three CBT studies[39,40,50] reported change from baseline to post treatment; all three reported significant improvements on most outcomes for both the CBT and MI groups. One study investigating possible mechanisms for changes in cannabis use reported that participants in both the 9-session CBT and 2-session MET groups increased their coping skills relative to wait list with no significant difference between CBT and MET, and that this increase in coping skills was associated with reduction in cannabis use.[39] Effect sizes at 12 weeks (based on data from one study[39]) ranged from 0.4 to 0.5 for both cannabis use and severity of dependence outcomes.

One further study[56] reported that 16-session dynamic psychotherapy was significantly better than one-session MI; however, limited outcomes were reported (i.e. percentage abstinent, severity of symptoms).

Results for later follow-ups were again mixed. Three studies of CBT reported between-group data at later follow-ups. Two of these studies[39,53] reported that CBT (6 or 9 sessions) was significantly better than MET (1 or 2 sessions) on some outcomes (some cannabis use, dependence) but not other outcomes (some cannabis use, cannabis problems) at 9 and 15 months' follow-up. The third study[50] reported no significant difference on most outcomes for CBT plus social support (14 group sessions) compared with MET (2 individual sessions) at 16 months' follow-up. The study of dynamic psychotherapy did not report later follow-up data. Two studies[39,50] reported change from baseline at follow-up (9–16 months), both finding significant improvements on most outcomes in both the CBT and brief MI groups. Effect sizes at 9 months (based on data from one study[39]) ranged from 0.3 to 0.5 for both cannabis use and severity of dependence outcomes.

TABLE 8 Summary for CBT or psychotherapy compared with brief MI (general population)

Comparison	Number of studies, number randomised (number followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer (number of sessions)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
CBT vs. brief MI	Four studies[39,40,50,53] (see *Table 9*), *n* = 707 (581), high 4	CBT (6–14 sessions)	MI/MET (1–4 sessions)	Three individual, one group vs. individual, 6–18 weeks	Mixed results: one study:[39] CBT-9 significantly better than MET-2 on most outcomes (one study).[39] Two studies:[40,50] no significant difference on most outcomes (CBT-14 vs. MET-2/4); one study[40] had few participants	Significant change: three studies:[39,40,50] significant improvement baseline to post treatment on most outcomes, CBT and MI groups	9–16 months	Mixed results: two studies:[39,53] CBT-6/9 significantly better than MET-1/2 on some outcomes but not others at 9 and 15 months. One study:[50] no significant difference on most outcomes for CBT-14 vs. MET-2 at 16 months	Significant change: two studies:[39,50] significant improvement from baseline on most outcomes in CBT and MI groups at 9–16 months
Supportive–expressive dynamic psychotherapy vs. brief MI	One study[56] *n* = 40 (40), high	Supportive–expressive dynamic psychotherapy (16 sessions)	MI (1 session)	NR, NR	Significant difference (limited data): one study:[56] psychotherapy-16 better than brief MI-1, limited outcomes				

CBT-6/9, six/nine-session CBT; CBT-9, nine-session CBT; CBT-14, 14-session CBT; MET-1/2, one/two-session MET; MET-2, two-session MET; MET-2/4, two/four-session MET; MI-1, one-session MI; psychotherapy-16, 16-session psychotherapy intervention.

TABLE 9 Results per study for CBT or psychotherapy compared with brief MI (general population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer (number of sessions), number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Babor 2004[39] and Litt 2005[72] (MTP), USA, high use (DSM-IV 100%), voluntary + referral, 36 years (18–62 years)	CBT/MET/CaseM (9) (6.5), $n = 156$ (133)	MET (2) (1.6), $n = 146$ (128)	Individual, 12 weeks	Significant difference: • Days used ($d = 0.52$) • % abstinent • Periods use per day ($d = 0.4$) • Dependence symptoms (DSM-IV) ($d = 0.52$) • Abuse symptoms (DSM-IV) ($d = 0.38$) • Cannabis problems (MPS) ($p =$ NR) No significant difference: • Joints per day, $p =$ NS Mechanism: CBT-9 and MET-2 increased coping skills relative to wait list (no difference between CBT and MET). Increase in coping skills reduced cannabis use	Significant change: • All outcomes (CBT and MET)	9 months, 15 months	Significant difference: • Days used, $p < 0.001$ ($d = 0.37$) • Periods use per day, $p < 0.01$ • Dependence symptoms, $p < 0.01$ ($d = 0.31$) • Abuse symptoms, $p < 0.01$ ($d = 0.45$) No significant difference: • Joints per day, $p =$ NS • % abstinent, $p =$ NS • Cannabis problems (MPS), $p =$ NS Significant difference: • Days used, $p =$ sig ($d = 0.22$) • % abstinent, $p < 0.001$ No significant difference: • Joints per day, $p =$ NS • Cannabis problems (MPS), $p =$ NS	Significant change: • All outcomes (CBT and MET)

continued

TABLE 9 Results per study for CBT or psychotherapy compared with brief MI (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer (number of sessions), number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Budney 2000,[40] USA, high use (DSM-III-R 100%), voluntary, 32 years (≥ 18 years)	CBT/MET (14) (NR), $n = 20$ (15)	MET (4) (NR), $n = 20$ (16)	Individual, 14 weeks	No significant difference: • Days used • % abstinent • Continuous weeks abstinent • Severity of dependence (ASI) • Cannabis problems (MCQ) • Readiness to change (URICA) (p = NS for all)	Significant change: • Days used • Severity of dependence • Cannabis problems • ($p < 0.05$, all groups) • Readiness to change, $p < 0.05$ (MET only)			
Copeland 2001,[53] Australia, high use (DSM-IV 96%), voluntary, 32 years (≥ 18 years)	CBT (6) (4.2), $n = 78$ (58)	MI (1), $n = 82$ (61)	Individual, 6 weeks			9 months	Significant difference: • SDS, $p = 0.04$ No significant difference: • Days abstinent, p = NS • % abstinent, $p = 0.6$ • Daily consumption, $p = 0.3$ • Cannabis problems (CPQ), $p = 0.08$	
Grenyer 1997[56] (abstract), Australia, high use (DSM-IV 100%), NR, 34 years (NR)	SEDP (16) (NR), $n = 20$ (20)	MI (1), $n = 20$ (20)	NR, NR, 16 sessions	Significant difference: • Index severity of symptoms, $p < 0.05$ • % abstinent, $p < 0.001$				

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer (number of sessions), number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Stephens 2000,[50] Lozano 2006[78] and DeMarce 2005,[79] USA high use (DSM-III-R 98%), voluntary, 34 years (≥ 18 years)	CBT/RP/social support (14) (8.4) (group), $n = 117$ (95)	MI (2) (NR) (individual), $n = 88$ (75)	Group vs. individual, 18 weeks	No significant difference: • Days used • Periods' use per day • % abstinent • Number of dependence symptoms (MDS) • Cannabis problems (all $p = NS$)	Significant change: • All outcomes ($p < 0.001$, all groups)	16 months	No significant difference: • Days used • Periods' use per day • % abstinent • Number of dependence symptoms (MDS) • Cannabis problems (all $p = NS$)	Significant change: • All outcomes ($p < 0.001$, all groups)

CaseM, case management; CBT-9, nine-session CBT; MCQ, Marijuana Craving Questionnaire; MET-2, two-session MET; MDS, Marijuana Dependence Scale; MTP, Marijuana Treatment Project; NR, not reported; NS, not significant; RP, relapse prevention; SEDP, supportive–expressive dynamic psychotherapy; URICA, University of Rhode Island Change Assessment Scale.

Effects of intervention characteristics

In terms of number of sessions, this section compares four studies of CBT (6–14 sessions) with briefer MI/MET treatments (1–4 sessions). As described above, some studies showed better results for CBT than MI (one[39] post treatment, two at later follow-ups[39,53]), whereas others showed no significant differences (two[40,50] post treatment, one at later follow-ups[50]). When CBT gave better outcomes, this may be owing to the nature of the CBT treatment, or the fact that more sessions were provided, or a combination of the two. In terms of group compared with individual treatments, one study[50] showed little difference between group CBT plus social support and individual MI (although both groups improved from baseline), whereas studies of individual CBT compared with MI showed mixed results, as described above.[39,40,53]

Effects of population characteristics

It was not possible to assess the effects of baseline cannabis use/dependence, as all studies were classified as high use. In terms of recruitment method, three CBT studies used voluntary recruitment[40,50,53] and showed mixed results, whereas the one study[39] using a combination of voluntary recruitment and referrals showed mostly significant effects; however, no studies used referrals only, so the significance of this is not clear.
It was not possible to assess effects of participant age, as all studies in this grouping had a similar mean age (32–36 years).

Cognitive–behavioural therapy compared with other interventions (or different cognitive–behavioural therapy format or duration)

Description of studies

Four studies[44,49,63,65] ($n = 462$ randomised, 365 followed up) compared CBT (4–10 sessions) with another intervention (social support group,[49] case management sessions[44]) or compared individual with group CBT[65] or CBT over different durations (*Tables 10* and *11*).[63] Two studies[44,49] reported overall session attendance (of both interventions), ranging from 58% to 76%, with both studies reporting no significant differences in attendance between the two interventions (session attendance not reported in two studies[63,65]). Participants were classified as having high baseline use in two studies[44,49] and low use in two studies.[63,65] Two studies were conducted in the USA,[44,49] one in Canada[65] and one in Brazil.[63]

Main results

One study[49] reported no significant difference between 10 sessions of group CBT and 10 sessions of group social support, either post treatment or at 15 months' follow-up. A further study[44] reported no significant difference between 9 sessions of CBT and 9 sessions of case management (help with problems of daily living possibly related to cannabis use), either post treatment or at 14 months' follow-up. However, both studies reported significant improvements from baseline in both groups, which were maintained after 14–15 months. The other two studies[63,65] compared CBT format or duration and are discussed below.

Effects of intervention characteristics

One study[65] compared four sessions of individual with group CBT; however, only 17 cannabis users were analysed and only one relevant outcome reported (days abstinent). Both groups improved from baseline and this was maintained at 12 months. Results non-significantly favoured individual CBT post treatment but this effect was not maintained at 12 months. Another study[63] compared four sessions of CBT over either a 12- or a 4-week period. Post-treatment results significantly favoured 12-week treatment on some outcomes (i.e. dependence, cannabis problems) but not cannabis use outcomes.

Effects of population characteristics

Studies in this category were too heterogeneous in terms of interventions/comparators to allow meaningful assessment of the effects of population characteristics.

TABLE 10 Summary for CBT compared with other intervention (or different format or duration) (general population)

Comparison	Number of studies, number randomised (followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer (number of sessions)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
CBT vs. other intervention (or different format or duration)	Four studies,[44,49,63,65] (see *Table 11*), *n* = 462 (365), high 2,[44,49] low 2[63,65]	CBT (4–10 sessions)	Social support group, CaseM, group vs. individual CBT, CBT over different durations	Two individual, one group, one group vs. individual, 4–12 weeks	Mixed results: one study:[49] no significant difference between group CBT-10 and social support group-10. One study:[44] no significant difference between CBT-9 and nine CaseM sessions. One study:[65] favours individual vs. group CBT-4 (one outcome, small study). One study:[63] CBT-4 over 12 weeks vs. 4 weeks: favours 12 weeks on some outcomes, not others	Significant change: three studies:[44,49,65] significant improvement baseline to post treatment on most outcomes in both groups	12–15 months	No significant difference: one study:[49] no significant difference between group CBT-10 and social support group-10 at 15 months. One study:[44] no significant difference between CBT-9 and nine CaseM sessions at 14 months. One study:[65] no difference between individual vs. group CBT-4 at 12 months (one outcome, small study)	Significant change: three studies:[44,49,65] significant improvement from baseline on most outcomes in both groups at 14–15 months

CaseM, case management; CBT-4, four-session CBT; CBT-9, nine-session CBT; CBT-10, 10-session CBT; social support group-10, 10-session social support group.

TABLE 11 Results per study for CBT vs. other intervention (general population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Jungerman 2007,[63] Brazil, low use (≥ 13 day/month), NR, 32 years (18–58 years)	CBT/MI/RP (4) (NR) (over 12 weeks), $n = 52$ (35)	CBT/MI/RP (4) (NR) (over 4 weeks), $n = 56$ (37)	Individual, 4–12 week	Significant difference (favours 12 weeks): • Dependence symptoms (DSM-III), $p = 0.035$ • Severity dependence (ASI), $p = 0.012$ • Cannabis problems (MPS), $p = 0.02$ No significant difference: • Days used, $p = 0.671$ • Periods used per day, $p = 0.301$ • Joints per day, $p = 0.937$				

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Kadden 2007[44] and Litt 2008,[77] USA, high use (DSM-IV 100%), voluntary, 33 years (≥ 18 years)	CBT/MET (9) (5.2[a]), $n = 61$ (55)	CaseM (9) (5.2[a]), $n = 62$ (54)	Individual, 9 weeks	No significant difference: • Days abstinent • Joints per day • Severity of dependence (ASI) • Cannabis problems (MPS) • RCQ • Coping strategies score (all $p = NS$)	Significant change: • Days abstinent • Severity dependence • Cannabis problems • Coping strategies • ($p < 0.001$, all groups)	14 months	No significant difference: • Days abstinent • Joints per day • Severity of dependence (ASI) • Cannabis problems (MPS) • RCQ • Coping strategies score (all $p = NS$)	Significant change: • Days abstinent • Joints per day • Severity dependence • Cannabis problems • Coping strategies • ($p < 0.001$, all groups)
Sobell 2009,[65] Canada, low use (not severe) voluntary + referral, 32 years (≥ 18 years)	CBT/MI (4) (NR) (individual), $n = NR$ (8)	CBT/MI (4) (NR) (group), $n = NR$ (9)	Individual vs. group, NR, four sessions	No significant difference: • Days abstinent, $p = 0.07$ (favours individual; note few participants)	Significant change: • Days abstinent, $p < 0.05$	12 months	No significant difference: • Days abstinent, $p = 0.86$	Significant change: • Days abstinent, $p =$ significant

continued

TABLE 11 Results per study for CBT vs. other intervention (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Stephens 1994,[49] USA, high use (≥ 17 day/ month), voluntary, 32 years (18–65 years)	CBT/RP (10) (7.6[b]), $n = 106$ (80)	Social support group (10) (7.6[b]), $n = 106$ (87)	Group, 12 weeks	No significant difference: • Days used, $p = NS$ • % abstinent, $p < 0.10$ • Cannabis problems (DAST), $p = NS$	Significant change: • Days used • Cannabis problems • ($p < 0.001$, both groups)	15 months	No significant difference: • Days used, $p = NS$ • % abstinent, $p = NS$ • Cannabis problems (DAST), $p = NS$	Significant change: • Days used • Cannabis problems • ($p < 0.001$, both groups)

CaseM, case management; DAST, Drug Abuse Screening Test; NR, not reported; NS, not significant; RP, relapse prevention.
a Average attendance across groups, with no significant difference between groups, $p > 0.36$.
b Average attendance across groups, with no significant difference between groups, *p*-value NR.

Telephone- or internet-based cognitive–behavioural therapy or counselling compared with wait list or other interventions

Description of studies

Three studies[55,61,70] ($n = 1682$ randomised, 481 followed up) compared telephone- or internet-based interventions with wait list or education controls (*Tables 12* and *13*). Interventions included telephone-delivered CBT,[55] internet-delivered CBT[70] and internet-delivered counselling.[61] Participants were classified as having high baseline use in one study[61] and low use in two studies.[55,70] Two studies reported session attendance for the CBT arm of the study, reporting mean attendances of 83%[55] and 58%.[70] Two studies were conducted in Australia[55,70] and one in Germany.[61]

Main results

One study[55] reported significantly better results for four sessions of telephone-delivered CBT than wait list control on most outcomes post treatment (i.e. dependence, cannabis problems, some cannabis use outcomes), with some effects maintained at 3 months (i.e. dependence and problems, not cannabis use). Both the telephone-delivered CBT and wait list groups showed improvements from baseline post treatment and at 3 months. Another study[70] compared six sessions of internet-based CBT with written cannabis information. Results post treatment significantly favoured internet-delivered CBT on some outcomes (i.e. some cannabis use) but not others (i.e. abstinence, dependence), while all outcomes (i.e. cannabis use, dependence) were significant or borderline significant in favour of internet-delivered CBT at 3 months; both the internet-delivered CBT and control groups showed improvements from baseline post treatment and at 3 months. Effect sizes of 0.3 were observed for cannabis use outcomes post treatment and at 3 months.[70] A further study[61] reported better outcomes for 50-day internet-based counselling than for wait list control at 3-month follow-up, on the limited outcomes reported (i.e. cannabis use, self-efficacy).

Effects of intervention characteristics

The three studies were too heterogeneous in their interventions and comparators to allow meaningful assessment of the effects of other intervention characteristics.

Effects of population characteristics

In terms of baseline cannabis use/dependence, the study classed as high use[61] showed slightly more positive effects than the two studies classed as low use,[55,70] but this comparison is based on limited data. All three studies used voluntary recruitment and all showed some positive results. Mean age ranged from 25 years to 36 years; however, the effect of age could not be meaningfully assessed owing to the small number of studies in this category.

TABLE 12 Summary for telephone- or internet-based CBT or counselling compared with wait list or other (general population)

Comparison	Number of studies, number randomised (followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Computer-/tele-CBT vs. wait list or other	Three studies[55,61,70] (see *Table 13*), *n* = 1682 (481), high 1,[61] low 2[55,70]	Tele-CBT (4 sessions), internet-delivered CBT (6 sessions) or internet counselling (50 days)	Wait list or written information	Three individual, 3–7 weeks	Significant difference (mostly): one study:[55] tele-CBT-4 better than wait list on most outcomes. One study:[70] internet-delivered CBT-6 better than written information on some outcomes, not others	Significant change: two studies:[55,70] significant improvement baseline to post treatment on most outcomes in both groups	3 months	Significant difference: one study:[55] tele-CBT-4 better than wait list on most outcomes at 3 months. One study:[70] internet-delivered CBT-6 better than written material, most outcomes, 3 months. One study:[61] internet counselling better than wait list on most outcomes at 3 months	Significant change: two studies:[55,70] significant improvement from baseline on most outcomes in both groups at 3 months

Tele-CBT, telephone-delivered CBT; tele-CBT-4, four-session telephone-delivered CBT; internet-delivered CBT-6, six-session internet-delivered CBT.

TABLE 13 Results per study for telephone- or internet-based CBT or counselling compared with wait list or other (general population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Gates 2012,[55] Australia, low use (98% SDS ≥ 3), voluntary, 36 years (≥ 16 years)	Tele-CBT/MI (4) (3.3), $n = 79$ (54)	Wait list, $n = 81$ (72)	Individual, 3 weeks	Significant difference: • Amount per day, $p = 0.017$ • SDS, $p < 0.001$ • Cannabis problems (CPQ), $p < 0.001$ No significant difference (borderline): • Days abstinent, $p = 0.054$	Significant change: • All outcomes ($p < 0.001$, both groups)	3 months	Significant difference: • Severity dependence, $p = 0.001$ • Cannabis problems (CPQ), $p = 0.006$ No significant difference (borderline): • Days abstinent, $p = 0.057$ No significant difference: • Amount per day, $p = 0.340$	Significant change: • All outcomes ($p < 0.001$, both groups)

continued

TABLE 13 Results per study for telephone- or internet-based CBT or counselling compared with wait list or other (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Rooke 2013,[70] Australia, UK, USA, other, low use (≥ 1 day/month), voluntary, 31 years (≥ 18 years)	Internet-based CBT/MI (6) (3.5), $n = 119$ (76)	Written cannabis information, $n = 111$ (73)	Individual, 6 weeks	Significant difference: • Days used, $p = 0.02$ ($d = 0.30$) • Amount per month, $p = 0.01$ ($d = 0.34$) No significant difference: • % abstinent, $p = 0.10$ • SDS, $p = 0.49$	Significant change: • Days used • Amount per month • Severity of dependence ($p < 0.001$, both groups)	3 months	Significant difference: • Days used, $p = 0.02$ ($d = 0.33$) • Severity dependence, $p = 0.001$ No significant difference (borderline): • % abstinent, $p = 0.06$ ($d = 0.25$) • Amount per month, $p = 0.06$	Significant change: • Days used • Amount per month • Severity dependence • ($p < 0.001$, both groups)
Tossmann 2011,[61] Germany, high use (DSM-IV 92%), voluntary, 25 years (NR)	Internet-based counselling (50 days), $n = 863$ (100)	Wait list, $n = 429$ (106)	Individual, 7 weeks			3 months	Significant difference: • Days used, $p < 0.001$ • Amount per month, $p = 0.003$ • Use-related self-efficacy, $p < 0.001$	

Tele-CBT, telephone-delivered CBT.

Brief motivational interviewing compared with wait list or assessment only

Description of studies

Ten studies[39,43,45,46,48,50,51,53,67,71] ($n = 2437$ randomised, 2288 followed up) compared a brief intervention (1 or 2 sessions of MET, MI or personalised feedback) with wait list or AO (*Tables 14* and *15*). One study assessed a internet-based intervention (personalised feedback).[45] One study provided a group MI session[67] and the other nine provided individual sessions. Eight studies[39,43,46,48,50,51,53,71] reported session attendance, ranging from 80% to 100%. Those interventions involving 1 session did not have a markedly increased attendance compared with those involving more than 1 session [mean attendance across studies: 1-session interventions (four studies) – 91%; 2 or more session interventions (four studies) – 88%]. Participants were classified as having high baseline use in four studies[39,50,51,53] and low use in six studies.[43,45,46,48,67,71] Seven studies were conducted in the USA,[39,43,45,46,48,50,51] one in Australia,[53] one in Switzerland[67] and one across four countries.[71]

Main results

Five studies reported between-group data post treatment and the results showed a mixed picture with some significant effects.[39,43,48,50,51] One study[50] (with high baseline use) reported significantly better results for two-session MET than wait list on all outcomes (cannabis use, dependence, problems), whereas four studies[39,43,48,51] (two high,[39,51] two low use[43,48]) reported that MI/MET (one or two sessions) gave significantly better results than wait list or AO on some outcomes (i.e. most cannabis use outcomes, dependence) but not others (i.e. some cannabis use outcomes, problems). Three studies reported change from baseline to post treatment, all of which reported significant improvements on most outcomes in both groups (two studies)[48,50] or in the MI group (one study).[39]

Two studies reported effect sizes at post treatment and one at a later follow-up point.[39,46] Effect sizes (Cohen's *d*) at post treatment ranged from 0.29 to 0.60 for cannabis use outcomes and were 0.33 for dependence symptoms.[39] Another study reported effect sizes as RRs, where the effect size for cannabis use outcomes ranged from 0.76 to 0.99 at post treatment (3 months) and was 0.90 for cannabis problems, whereas at follow-up (6 months) the RR ranged from 1.03 to 1.11 and was 1.15 for cannabis problems.[46]

At later follow-ups, seven studies reported mixed between-group results, again with some significant effects.[43,45,46,48,53,67,71] At 3 months, two studies[48,71] (both low baseline use) reported significantly better results for MET/MI on the single outcome reported (cannabis use), whereas three studies[43,45,46] (all low use) showed better results for MET/MI on some outcomes (some cannabis use) but not others (some cannabis use, problems). At 6 months, four studies[45,46,48,67] (all low use) reported no significant differences between MET/MI and wait list/AO, while at 9 months one study[53] (high use) reported better results for MET/MI on some outcomes (some cannabis use, dependence, problems). Three studies reported significant improvements from baseline to 3–6 months on most outcomes in both groups (two studies)[48,71] or in the MI group (one study),[39] whereas one study[45] reported no significant change following internet-based personalised feedback at 3–6 months.

Effects of intervention characteristics

There was no obvious difference in results between studies of one-session or two-session MI/MET, with most studies showing mixed results both post treatment (a single 1-session study[51] compared with four 2-session studies[39,43,48,50]) and at later follow-ups (five 1-session studies[45,46,53,67,71] compared with two 2-session studies[43,48]). The one study[67] using a group intervention (1-session MI) showed no significant effect at 6 months on the single outcome reported (cannabis days of use); it is unclear whether this reflects the group delivery or other factors (only a single session was provided and results were not measured earlier than 6 months).

TABLE 14 Summary for brief MI vs. wait list or AO (general population)

Comparison	Number of studies, number randomised (followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Brief MI vs. wait list or AO	10 studies,[39,43,45,46,48,50,51,53,67,71] (see *Table 15*), *n* = 2437 (2288), high 4,[39,50,51,53] low 6[43,45,46,48,67,71]	MET, MI or personalised feedback (1 or 2 sessions, one internet-based study)	Wait list or AO	Nine individual, one group, 1 session or 2–5 weeks	Some significant difference • One study (high use):[50] MET (2 sessions) better than wait list on all outcomes • Four studies (two high, two low use):[39,43,48,51] MI/MET (1 or 2 sessions) significantly better than wait list/AO on most cannabis use outcomes, not some other outcomes	Significant change: • Three studies: significant improvement baseline to post treatment on most outcomes in both groups (two studies)[48,50] or in MI group (one study)[39]	3–9 months	Some significant difference: • At 3 months: Two studies (low use):[48,71] MET/MI significantly better on single outcome reported (cannabis use) Three studies (low use):[43,45,46] better on some outcomes, not others • At 6 months: Four studies (low use):[45,46,48,67] no significant difference • At 9 months: One study (high use):[53] better on some outcomes	Significant change (most): Three studies: significant improvement from baseline at 3–6 months on most outcomes in both groups (two studies)[48,71] or MI group (one study)[39] One study:[45] no significant change after internet-based PF at 3–6 months

PF, personalised feedback.

TABLE 15 Results per study for brief MI vs. wait list/AO (general population)

Study, country, cannabis use, recruitment, mean age (range), category	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Babor 2004[39] and Litt 2005[72] (MTP), USA, high use (DSM-IV 100%). voluntary + referral, 36 years (18–62 years)	MET (2) (1.6), $n = 146$ (128)	Wait list, $n = 148$ (137)	Individual, 5 weeks	Significant difference: • Days used ($d = 0.59$) • Joints/day ($d = 0.29$) • Dependence symptoms (DSM-IV) ($d = 0.33$) • Periods use/day (p-values NR) ($d = 0.6$) No significant difference: • % abstinent, $p = 0.10$ • Abuse symptoms (DSM-IV), $p =$ NS • Cannabis problems (MPS), $p =$ NS	Significant change: • All outcomes (MET)	9 months		Significant change: • All outcomes (MET) (9 months)
Copeland 2001,[53] Australia, high use (DSM-IV 96%), voluntary, 32 years (≥ 18 years)	MI (1) (88% attended), $n = 82$ (61)	Wait list, $n = 69$ (51)	Individual, 1 session			9 months	Significant difference: • % abstinent, $p = 0.05$ • SDS, $p = 0.008$ • Cannabis problems (CPQ), $p = 0.004$ No significant difference: • Days abstinent, $p = 0.09$ • Daily consumption, $p = 0.2$	

continued

TABLE 15 Results per study for brief MI vs. wait list/AO (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range), category	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
de Dios 2012,[43] USA, low use (≥ 3 day/month), voluntary, 23 years (18–29 years), female only	MI/meditation (2) (2), $n = 22$ (17)	AO, $n = 12$ (10)	Individual, 2 week	Significant difference: • Days used, $p = 0.015$ No significant difference: • % abstinent, $p =$ NS		3 months	Significant difference: • Days used, $p = 0.026$ No significant difference: • % abstinent, $p =$ NS	
Gmel 2013,[67] Switzerland, low use (any), voluntary, 20 years (19–20 years), men only	Brief MI (1); 50% telephone, booster session at 3 months, $n = 174$ (NR)	AO, $n = 204$ (NR)	Group, 1 session			6 months	No significant difference (MI vs. AO): • Days used, $p = 0.342$ (MI vs. AO) No significant difference (MI +/– booster session): • Days used, $p = 0.508$	
Humeniuk 2012,[71] Australia, USA, Brazil, India, low use (high use excluded), referral, 31 years (16–62 years)	Brief MI (1) (100% attendance), $n = 212$ (NR)	Wait list, $n = 183$ (NR)	Individual, 1 session			3 months	Significant difference: • Cannabis use (ASSIST), $p < 0.05$	Significant change: • Cannabis use, $p < 0.001$ (across all groups)

Study, country, cannabis use, recruitment, mean age (range), category	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Lee 2013,[46] USA, low use (≥ 5 day/month) referral, 20 years (18–25 years), students	Brief MI (1) (55% in person, 30% written, 15% none), $n = 106$ (87)	AO, $n = 106$ (94)	Individual, 1 session			3 months, 6 months	Significant difference: • Joints per week, $p < 0.05$ (RR = 0.76, 95% CI 0.60 to 0.96)[a] No significant difference: • Days used, $p =$ NS (RR = 0.96, 95% CI 0.80 to 1.15)[a] • Cannabis problems (RMPI), $p < 0.10$ (RR = 0.9, 95% CI 0.76 to 1.07)[a] No significant difference: • Days used, $p =$ NS (RR = 1.11, 95% CI 0.85 to 1.43)[a] • Joints per week, $p < 0.05$ (RR = 1.03, 95% CI 0.73 to 1.46)[a] • Cannabis problems (RMPI), $p =$ NS (RR = 1.15, 95% CI 0.90 to 1.47)[a]	

continued

TABLE 15 Results per study for brief MI vs. wait list/AO (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range), category	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Lee 2010,[45] USA, low use (any), referral, 18 years (17–19 years), students	Internet-based personalised feedback (1) (NR), $n = 171$ (162)	AO, $n = 170$ (162)	Individual, 1 session			3 months, 6 months	No significant difference: • Days used, $p = NS$ • Cannabis problems (RMPI), $p = NS$ Significant difference (subgroup): • Greater reduction in use for PF (not AO) participants with (a) higher contemplation to change use or (b) family history of drug problems No significant difference: • Days used, $p = NS$ • Cannabis problems (RMPI), $p = NS$	No significant change: • Days used • Cannabis problems • No significant change: • Days used • Cannabis problems (all $p = NS$)

Study, country, cannabis use, recruitment, mean age (range), category	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Stein 2011,[48] USA, low use (DSM-IV 40%), voluntary, 21 years (18–24 years), female only	MI (2) (1.7), $n = 163$ (NR)	AO, $n = 169$ (NR)	Individual, 4 weeks	Significant difference (subgroup): • whole group not treatment-seeking. Significant effects at all time points for those with desire to quit No significant difference: • Cannabis use (%), $p = 0.174$	Significant change: • Cannabis use, $p =$ significant (both groups)	3 months, 6 months	Significant difference: • Cannabis use (%), $p = 0.010$ No significant difference: • Cannabis use (%), $p = 0.202$	Significant change: • Cannabis use, $p =$ significant (both groups) Significant change: • Cannabis use, $p =$ significant (both groups)
Stephens 2007,[51] USA, high use (≥ 15 day/month), voluntary, 32 years (18–57 years)	MI/personalised feedback (1) (89% attendance), $n = 62$ (58)	Wait list, $n = 64$ (62)	Individual, 1 session, follow-up at 7 weeks	Significant difference: • Days used, $p < 0.05$ • Periods use per day, $p < 0.05$ • Dependence symptoms (DSM-IV), $p < 0.05$ No significant difference: • Cannabis problems (MPS), $p =$ NS • RCQ, $p =$ NS				

continued

TABLE 15 Results per study for brief MI vs. wait list/AO (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range), category	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Stephens 2000,[50] Lozano 2006[78] and DeMarce 2005,[79] USA, high use (DSM-III-R 98%), voluntary, 34 years (≥ 18 years)	MI (2) (86% attendance both), $n = 88$ (75)	Wait list, $n = 86$ (79)	Individual, 4 weeks	Significant difference: • Days used, $p < 0.001$ • Periods use per day, $p < 0.001$ • % abstinent, $p < 0.001$ • Number of dependence symptoms (MDS), $p < 0.001$ • Cannabis problems, $p < 0.001$	Significant change: • All outcomes ($p < 0.001$, all groups)			

ASSIST, Alcohol Smoking and Substance Involvement Screening Test; MDS, Marijuana Dependence Scale; NR, not reported; NS, not significant; PF, personalised feedback; RMPI, Rutgers Marijuana Problem Index.
a RRs estimated via a negative binomial model.

Effects of population characteristics

In terms of baseline cannabis use/dependence, at post treatment one study[50] with high baseline use reported better results for MET on all outcomes, whereas four studies[39,43,48,51] (two high, two low use) reported better results for MI/MET on some outcomes but not others. At later follow-ups, results were mixed, both among the one study[53] with high use and the six[43,45,46,48,67,71] with low use. Therefore (based on the post-treatment data) studies with high baseline use/dependence may have been slightly more likely to show significant effects, but there is little strong evidence for this.

There was no clear difference in results according to recruitment method; the three studies[45,46,71] recruiting participants via referral and the one[39] recruiting via referral and voluntary methods all showed mixed results which were not obviously different from the other six studies[43,48,50,51,53,67] using voluntary recruitment. Mean age ranged from 18 years to 36 years. Five studies[43,45,46,48,67] assessed relatively young populations (mean age 18–23 years, upper age range in teens or twenties); these studies were all classed as low baseline use. There were no clear differences in effects according to age, with the five studies[43,45,46,48,67] of younger populations showing mixed results in a similar manner to other studies.

In addition, two studies with low baseline use reported subgroup effects.[45,48] One study[45] reported no significant difference between internet-based personalised feedback and control across all participants, but a significant difference for participants with a higher contemplation to change use or a family history of drug problems. Another study,[48] in which participants were not seeking treatment for their cannabis use, reported no significant difference between brief MI and AO across all participants, but significant differences for those with a desire to cease use.

Brief motivational interviewing compared with other interventions

Description of studies

Three studies[51,62,75] ($n = 2002$ randomised, 754 followed up) compared a brief intervention (one session of MI or telephone MI) with education controls (regarding cannabis or general health) (*Tables 16* and *17*). All MI sessions were individual (not group). One study[51] reported session attendance, in which 89% of participants attended a MI session and 94% attended a 'cannabis education' session. Participants were classified as having high baseline use in one study[51] and low use in two studies.[62,75] Studies were conducted in the USA,[51] Canada[75] and Brazil.[62]

Main results

One study[51] of MI (1 session) compared with education control reported significantly better results for MI on some outcomes (i.e. some cannabis use outcomes, dependence) but not other outcomes (i.e. some cannabis use outcomes, cannabis problems), both post treatment and at 6 and 12 months' follow-up. Another study[75] reported no significant differences between 1-session MI and education after 3 and 12 months (only cannabis use outcomes were reported); however, all groups significantly improved from baseline. A further study[62] reported that one-session telephone MI was significantly better than education control on a single outcome (% abstinent) after 6 months, with an odds ratio of 1.6 (95% CI 1.2 to 2.0).

Effects of intervention and population characteristics

There were too few studies in this category to allow meaningful assessment of the effects of other study characteristics.

TABLE 16 Summary for brief MI compared with other interventions (general population)

Comparison	Number of studies, number randomised (followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer (number of sessions)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Brief MI vs. other intervention	Three studies[51,62,75] (see *Table 17*), *n* = 2002 (754), high 1,[51] low 2[62,75]	MI or tele-MI (1 session)	Cannabis or health education	Three individual, 1 session	Mixed results, limited data: one study:[51] MI-1 significantly better than education on most outcomes, not all	NR	3–12 months	Mixed results: two studies of MI-1 vs. education: MI-1 significantly better on some outcomes, not others (one study[51]); no significant difference (one study[75]); 3/6 months and 12 months. One study:[62] tele-MI-1 better than education on one outcome (6 months)	Limited data: one study:[75] significant improvement in MI-1 and education groups (3 months)

MI-1, one-session MI; tele-MI, telephone-delivered MI.

TABLE 17 Results per study for brief MI vs. other interventions (general population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Fernandes 2010,[62] Brazil, low use (NHSDA 88% dependent), voluntary, 25 years (11–NR years)	Tele-brief MI (1) (NR), $n = 873$ (262)	Written cannabis information, $n = 871$ (262)	Individual, 1 session			6 months	Significant difference: • % abstinent, $p < 0.05$ (OR = 1.6, 95% CI 1.2 to 2.0)	
Fischer 2012[75] Fischer 2013,[64] Canada, low use (≥ 12 day/month), voluntary, 20 years (18–28 years)	Brief MI (1) (NR), $n = 25$ (23)	Three education controls, $n = 109$ (90)	Individual, 1 session			3 months, 12 months	No significant difference: • Days used, $p = NS$ • Uses per day, $p = NS$ No significant difference: • Days used, $p = NS$ • Uses per day, $p = NS$	Significant change: • Days used, $p = 0.024$ (all groups), $p = NS$ (each group) No significant change: • Days used, $p = NS$ • Uses per day, $p = NS$

continued

TABLE 17 Results per study for brief MI vs. other interventions (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (mean number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Stephens 2007,[51] USA, high use (≥ 15 day/months), voluntary, 32 years (18–57 years)	MI/personalised feedback (1) (89% attended), $n = 62$ (58)	Cannabis education (1) (94% attended), $n = 62$ (59)	Individual, 1 session, follow-up at 7 weeks	Significant difference: • Days used, $p < 0.05$ • Periods use per day, $p < 0.05$ • Dependence symptoms (DSM-IV), $p < 0.05$ No significant difference: • Cannabis problems (MPS), $p = NS$ • RCQ, $p = NS$		6 months, 12 months	Significant difference: • Dependence symptoms, $p = 0.019$ No significant difference: • Days used, $p = 0.408$ • Periods use per day, $p = NS$ • Cannabis problems (MPS), $p = NS$ Significant difference: • Days used, $p = 0.019$ • Dependence symptoms, $p = 0.049$ No significant difference: • Periods use per day, $p = NS$ • Cannabis problems (MPS), $p = NS$	

NHSDA, National Health Survey on Drug Abuse; NS, not significant; OR, odds ratio; Tele-brief MI, telephone-delivered brief MI.

Contingency management (vouchers for abstinence) versus other interventions

Description of studies

Five studies[40–42,44,47] ($n = 680$ randomised, 581 followed up) compared contingency management (vouchers for abstinence assessed via urine tests), alone or in combination with CBT, with other interventions (*Tables 18* and *19*). One study also assessed computer-based CBT plus contingency management.[42] Comparators included CBT[40,41,44] (9–14 sessions), MET[40,42] (2–4 sessions), case management[44,47] (9 sessions) and CBT plus vouchers for completed CBT homework.[47] Three studies reported session attendance; attendance at the CBT plus voucher arms of the studies was reported as 61%[47] and 69%[41]. Attendance in the 'other' arms of the trials was reported as 67% (case management intervention)[47] and 63% (CBT intervention without vouchers).[41] One study[44] reported attendance across both arms (58%). All interventions were individual (not group). Participants were classified as having high baseline use in all five studies and all five studies were conducted in the USA.

Main results

Results post treatment differed from those at later follow-up. Four studies[40–42,44] reported between-group data post treatment; results favoured either CBT plus vouchers or vouchers alone over CBT alone. Three studies[40,42,44] reported better results (on some outcomes only) for CBT plus vouchers than for CBT or MET alone. In addition, two studies reported better results (again on some outcomes only) for vouchers alone than CBT alone (two studies)[41,44] or case management alone (one study).[44] One study[41] assessed continuous abstinence for ≥ 6 weeks and reported an odds ratio of 6.0 (95% CI 1.7 to 21.0) for vouchers alone compared with CBT and an odds ratio of 4.1 (95% CI 1.2 to 14.4) for CBT plus vouchers compared with CBT alone.

Later follow-ups indicated that positive results were maintained for combined treatment with CBT plus vouchers. However, the beneficial short-term results for vouchers alone were less likely to be maintained long term. Three studies[41,44,47] reported between-group data at 14–15 months. Two studies[41,44] reported better results for CBT plus vouchers than for either CBT or vouchers alone (on some outcomes) at 14–15 months' follow-up. Significant improvements from baseline were reported on some or most outcomes in all groups post treatment (three studies[40,41,44]) and at 14–15 months' follow-up (three studies[41,44,47]).

Two further studies made other comparisons. One study[42] reported no significant difference between CBT plus voucher and computer-based CBT plus voucher post treatment (however, only one outcome – weeks of continuous abstinence – was reported). Another study[47] reported that CBT plus voucher (for abstinence) gave better results than CBT plus voucher (for CBT homework) on some but not all outcomes at 5–8 months' follow-up.

Two studies[44,47] investigated potential mechanisms for changes in cannabis use and reported that long-term abstinence was predicted by abstinence during treatment and by increases in coping skills and self-efficacy. A further analysis of two studies[40,74] assessed ability to maintain abstinence, reporting that 54% of participants achieved at least 2 weeks' continuous abstinence at any point and, of these, 24% lapsed to cannabis use within 1 month, 46% within 3 months and 71% within 6 months.

Effects of intervention and population characteristics

It was difficult to assess the effects of study characteristics within this category as all studies were similar in many aspects of their design. All five studies[40–42,44,47] provided individualised treatment, all were classified as high baseline use, all used either voluntary recruitment (four studies[40,42,44,47]) or a combination of voluntary and referrals (one study[41]) and the mean age was 32–35 years in all five studies.

TABLE 18 Summary for contingency management (vouchers for abstinence) compared with other intervention (general population)

Comparison	Number of studies, number randomised (followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer (number of sessions)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Contingency management (vouchers for abstinence) vs. other	Five studies[40–42,44,47] (see *Table 19*), *n* = 680 (581), high 5	CBT + voucher, compCBT + voucher, voucher alone (all vouchers for negative urine tests)	CBT (9–14, MET (2–4), CaseM (9). CBT + voucher (for CBT homework)	Five individual, 8–14 weeks	Significant difference (some): CBT + voucher or voucher alone better than CBT alone: three studies:[40,42,44] CBT + voucher better than CBT or MET alone (some outcomes). Two studies: voucher alone better than CBT (two studies)[41,44] or case management (one study)[44] (some outcomes). One study:[42] no significant difference between CBT + voucher and compCBT + voucher (one outcome)	Significant change: three studies:[40,41,44] significant improvement baseline to post treatment on most outcomes in all groups	14–15 months	Significant difference (some): CBT + voucher better than CBT or voucher alone: two studies:[41,44] CBT + voucher better than CBT or voucher alone (some outcomes) at 14–15 months. Vouchers alone: good results post treatment but declined during follow-up; CBT + voucher better at later follow-ups[41,44] One study:[47] CBT + voucher (abstinence) better than CBT + voucher (CBT homework), some outcomes, 5–8 months. Mechanism: two studies:[44,47] long-term abstinence predicted by abstinence during treatment, coping skills and self-efficacy	Significant change (some): three studies:[41,44,47] significant improvement from baseline at 14–15 months on some/most outcomes (all groups)

CaseM, case management; CBT + voucher, CBT plus voucher incentives; compCBT + voucher, computer-delivered CBT plus voucher incentives.

TABLE 19 Results per study for contingency management (vouchers for abstinence) vs. other intervention (general population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Budney 2011[42] (abstract) ClinicalTrials.gov 2013,[73] USA, high use (DSM-IV 100%), voluntary, 35 years (18–65 years)	CBT/MET/voucher (9) (NR), $n = 29$ (16) CompCBT/MET/brief therapist/voucher (9) (NR), $n = 30$ (21)	MET (2) (NR), $n = 16$ (9)	Individual, 12 weeks	Significant difference (CBT + voucher or compCBT + voucher better than MET): • Continuous weeks abstinent • $p < 0.05$ (CBT + voucher vs. MET) • $p < 0.05$ (compCBT + voucher vs. MET) No significant difference (CBT + voucher vs. compCBT + voucher): • Continuous weeks abstinent, $p = NS$		12 months	Significant difference: • % abstinent, $p < 0.05$ (between all groups)	

continued

TABLE 19 Results per study for contingency management (vouchers for abstinence) vs. other intervention (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Budney 2006,[41] USA, high use (DSM-IV 100%), voluntary + referral 33 years (≥ 18 years)	CBT/voucher (14) (9.6[a]), $n = 30$ (26) Voucher (14), $n = 30$ (24)	CBT (14) (8.8[a]), $n = 30$ (26)	Individual, 14 weeks	Significant difference (voucher better than CBT): • Continuous weeks abstinent, $p = 0.02$ • Specific periods abstinence, $p = 0.02$ (continuous abstinence for ≥ 6 weeks, OR = 6.0, 95% CI 1.7 to 21.0) No significant difference (CBT + voucher vs. other groups): • Continuous weeks abstinent, $p = 0.20$ (CBT + voucher vs. CBT); $p = 0.32$ (voucher vs. CBT + voucher) • Specific periods abstinence, $p = 0.10$ (CBT + voucher vs. CBT) (continuous abstinence for ≥ 6 weeks, OR = 4.1, 95% CI 1.2 to 14.4) No significant difference (all groups): • Days used, $p = 0.71$ • Uses per day, $p = 0.70$ • % abstinent, $p =$ NS • Cannabis problems (MPS), $p =$ NS	Significant change: • Days used • Uses per day • Cannabis problems • ($p < 0.001$, all groups)	15 months	Significant or nearly significant difference (CBT + voucher better than either alone): • % abstinent • $p = 0.04$, OR = 2.45 (95% CI 1.01 to 5.93) (CBT + voucher vs. CBT) • $p = 0.08$, OR = 2.17 (95% CI 0.91 to 5.17) (CBT + voucher vs. voucher) No significant difference (voucher vs. CBT): • % abstinent, $p = 74$ No significant difference (all groups): • Days used, $p = 0.15$ • Uses per day, $p = 0.31$ • Cannabis problems (MPS), $p =$ NS	Change maintained post treatment: • Uses per day, $p = 0.94$ • Cannabis problems, $p =$ NS • (all groups, follow-up vs. post treatment) Change not maintained post treatment: • Days used, $p < 0.01$ • % abstinent, $p = 0.03$ • (all groups, follow-up vs. post treatment)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Budney 2000[40] and Moore 2003,[74] USA, high use (DSM-III-R 100%), voluntary, 32 years (≥ 18 years)	CBT/MET/voucher (14) (NR), $n = 20$ (14)	CBT/MET (14) (NR), $n = 20$ (15) MET (4) (NR), $n = 20$ (16)	Individual, 14 weeks	Significant difference (CBT + voucher better than CBT or MET): • % abstinent, $p < 0.05$ • Continuous weeks abstinent, $p < 0.05$ • Severity of dependence (ASI), p = significant No significant difference (all groups): • Days used, p = NS • Cannabis problems (MCQ), p = NS • Readiness to change (URICA), p = NS Additional outcome data: • Pooled analysis of this study and unpublished study (Moore 2003[74]): ○ 54% achieved ≥ 2 weeks abstinence at any point. Of these, 24% lapsed to cannabis use within 1 month, 46% within 3 months and 71% within 6 months	Significant change: • Days used • Severity of dependence • Cannabis problems • ($p < 0.05$, all groups) • Readiness to change, $p < 0.05$ (MET only)			

continued

TABLE 19 Results per study for contingency management (vouchers for abstinence) vs. other intervention (general population) (*continued*)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Kadden 2007[44] and Litt 2008,[77] USA, high use (DSM-IV 100%), voluntary, 33 years (≥ 18 years)	CBT/MET/voucher (9) (5.2), $n = 63$ (59) Voucher, $n = 54$ (50)	CBT/MET (9) (5.2), $n = 61$ (55) CaseM (9) (5.2), $n = 62$ (54)	Individual, 9 weeks	Significant difference (voucher vs. CaseM): • Days abstinent, $p < 0.05$ (voucher vs. CaseM); $p = NS$ for other comparisons • % abstinent: voucher then CBT + voucher highest levels at 2 months No significant difference: • Joints/day • Severity of dependence (ASI) • Cannabis problems (MPS) • RCQ • Coping strategies score (all $p = NS$)	Significant change: • Days abstinent • Severity of dependence • Cannabis problems • Coping strategies • ($p < 0.001$, all groups)	14 months	Significant difference: • % abstinent: CBT + voucher then CBT highest levels at 14 months while voucher only declined after 5 months • Continuous weeks abstinent during follow-up: CBT + voucher then voucher then CBT then CaseM (all $p < 0.05$) No significant difference: • Days abstinent • Joints/day • Severity of dependence (ASI) • Cannabis problems (MPS) • RCQ • Coping strategies score (all $p = NS$) Mechanism: short-term abstinence predicted abstinence during treatment; long-term abstinence predicted by coping skills and self-efficacy	Significant change: • Days abstinent • Joints/day • Severity of dependence • Cannabis problems • Coping strategies • ($p < 0.001$, all groups)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer (number of sessions) (mean number of sessions attended) number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Litt 2013,[47] USA, high use (DSM-IV 100%), voluntary, 33 years (≥ 18 years)	CBT/MET/voucher (abstinence) (9) (5.5[b]), $n = 73$ (66)	CaseM (9) (6.0), $n = 71$ (65) CBT/MET/voucher (homework) (9) (5.7[b]), $n = 71$ (65)	Individual, 8 weeks			5–8 months, 14 months	Significant difference (CBT + abstinence voucher better than CBT + homework voucher): • Days abstinent, $p < 0.05$ • % abstinent, $p < 0.05$ No significant difference (CBT + voucher vs. CaseM): • Days abstinent, $p =$ NS • % abstinent, $p =$ NS No significant difference (any groups): • Days abstinent, $p =$ NS • % abstinent, $p =$ NS • Cannabis problems (MPS), $p =$ NS • Mechanism: long-term abstinence predicted by abstinence during treatment, increase in coping skills and self-efficacy	Significant change: • Days abstinent • % abstinent, $p < 0.001$ (all groups) • Cannabis problems, $p < 0.001$

CaseM, case management; CBT + voucher, CBT plus voucher incentives; compCBT, computer-delivered CBT; compCBT + voucher, computer-delivered CBT plus voucher incentives; MCQ, Marijuana Craving Questionnaire; NS, not significant; OR, odds ratio; URICA, University of Rhode Island Change Assessment Scale.

a No significant difference between group treatment attendance, $p = 0.50$.

b No significant difference between group treatment attendance, $p > 0.75$.

Studies in populations with psychiatric conditions

Cognitive–behavioural therapy plus treatment as usual compared with treatment as usual

Description of studies

Four studies[52,66,68,69] ($n = 326$ randomised, 254 followed up) compared CBT (6–24 sessions) plus TAU with TAU alone (*Tables 20* and *21*). TAU generally consisted of antipsychotic medication and psychiatric condition monitoring. In addition, in one study[52] a self-help book on substance abuse was provided, and two studies[68,69] explicitly stated that a psychosocial intervention was provided to participants receiving TAU. In terms of the study interventions, two studies[52,68] provided individual CBT sessions, one[66] individual plus optional group sessions, and one[69] group sessions. Three studies reported session attendance: two reported percentage of participants attending all sessions (85%[66] and 67%[68]), while one study[69] reported the proportion attending more than 1 session (46%, 12-session intervention). Participants were classified as having high baseline use in three studies[66,68,69] and low use in one study.[52] One study was conducted in Switzerland,[66] one in Denmark,[68] one in Ireland[69] and one in Australia.[52]

Main results

Results indicated little effect of CBT plus TAU over TAU alone in this population; however, data were limited in that the numbers of analysed participants per study were relatively low (22–42 per group), which may affect significance levels. Furthermore, in one study, only 46% of the CBT group attended any sessions.[69] In addition, the provision of psychosocial and other interventions in the control groups as part of TAU may potentially have reduced any difference in outcomes between groups, although two[52,68] of three[52,68,69] studies showed no changes from baseline in either group.

All four studies[52,66,68,69] reported between-group data post treatment, each reporting a significantly better result for CBT plus TAU than TAU on a single outcome only and not on other outcomes. Outcomes with significant or near-significant effects in one study each were: joints per week, joints per month, number of days used and quality of life; however, there were no significant differences in days used, days abstinent or per cent abstinent. Other outcomes (i.e. severity of dependence, cannabis problems) were not reported in any study. At 10–12 months' follow-up, these four studies[52,66,68,69] reported no significant differences between CBT plus TAU and TAU alone on any cannabis use outcomes; however, one study[69] reported a significant difference in quality of life. Two studies[52,69] reported no significant improvements from baseline in any group either post treatment or at 12 months, while one study[66] reported a significant improvement in both groups on the single relevant outcome reported (joints per week).

Effects of intervention characteristics

There were no clear differences in results according to number of CBT sessions (6–24) or group compared with individual treatment.

Effects of population characteristics

There were no clear differences in results for the one study[52] classed as low baseline use/dependence compared with the three[66,68,69] with high use. In terms of recruitment method, three studies recruited via referrals only[52,66,68] and one via using a combination of voluntary recruitment and referrals;[69] all four showed little effect of CBT plus TAU over TAU alone. The effect of age on results could not be assessed as the mean age was similar across studies (26–29 years).

TABLE 20 Summary for CBT plus TAU compared with TAU (psychiatric population)

Comparison	Number of studies, number randomised (followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
CBT + TAU vs. TAU	Four studies,[52,66,68,69] (see *Table 21*), *n* = 326 (254), high 3,[66,68,69] low 1[52]	CBT (6–24 sessions) + TAU	TAU	Three individual, one group, 10–26 weeks	Few significant differences: four studies:[52,66,68,69] CBT (6–24 sessions) + TAU significantly better than TAU alone on one outcome, not others (note: low participant numbers may affect *p*-values; in one study only 46% CBT group attended any sessions[69])	Little significant change: one study:[66] significant improvement in both groups (single outcome). Two studies:[52,69] no significant improvement	10–12 months	No significant difference (almost): four studies: [52,66,68,69] no significant difference between CBT (6–24 sessions) + TAU and TAU alone at 10–12 months, except quality of life in one study[69] (note: low numbers may affect *p*-values; in one study only 46% CBT group attended any sessions[69])	Little significant change one study:[66] significant improvement in both groups at 12 months (single outcome). Two studies:[52,69] no significant improvement at 12 months

TABLE 21 Results per study for CBT plus TAU compared with TAU (psychiatric population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Baker 2006,[52] Australia, low use (≥ 4 day/month), referral, 29 years (15–61 years)	CBT/MI + TAU (10) (NR), *n* = NR (39)	TAU, *n* = NR (34)	Individual, 10 weeks	Significant difference: • Days used (change), *p* = 0.02 No significant difference: • % weekly use, *p* = NS • % abstinent, *p* = NS	No significant change: • Days used, *p* = NS (CBT or TAU)	12 months	No significant difference: • Days used (change), *p* = NS • % abstinent, *p* = NS • % weekly use, *p* = NS	No significant change: • Days used, *p* = NS (CBT or TAU)
Bonsack 2011,[66] Switzerland, high use (DSM-IV 82%), referral, 26 years (18–35 years)	CBT/MI + TAU (6) (5.1), *n* = 30 (22)	TAU, *n* = 32 (27)	Individual (+ optional group), 6 months	Significant difference: • Joints per week (change), *p* = 0.015 No significant difference: • Days abstinent, *p* = 0.83 • Days binge use, *p* = 0.48	Significant change: • Joints per week (both groups)	12 months	No significant difference: • Joints per week (change), *p* = NS • Days abstinent, *p* = 0.76 • Days binge use, *p* = 0.97	Significant change: • Joints per week (both groups)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer, number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Hjorthoj 2013[68] and Hjorthoj 2012,[80] Denmark, high use (ICD-10 100%), referral, 27 years (17–42 years)	CBT/MI + TAU (24) (16), $n = 52$ (38)	TAU, $n = 51$ (30)	Individual, 6 months	No significant difference (borderline): • Joints per month, $p = 0.06$ No significant difference: • Days used, $p = 0.42$ • % abstinent, $p = 0.61$		10 months	No significant difference: • Days used, $p = 0.75$ • % abstinent, $p = 0.37$ • Joints per month, $p = 0.23$	
Madigan 2013,[69] Ireland, high use (DSM-IV 100%), voluntary + referral, 28 years (16–65 years)	CBT/MI (12) (46% attended ≥ 1), $n = 59$ (42)	TAU, $n = 29$ (22)	Group, 12 weeks	Significant difference: • Quality of life (WHOQoL), $p = 0.01$ No significant difference: • Days used, $p = 0.86$	No significant change: • Days used, $p =$ NS (both groups)	12 months	Significant difference: • Quality of life (WHOQoL), $p = 0.05$ No significant difference: • Days used, $p = 0.39$	No significant change: • Days used, $p =$ NS (both groups)

NR, not reported; NS, not significant; WHOQoL, World Health Organization quality-of-life assessment.

Cognitive–behavioural therapy compared with other interventions

Description of studies

Three studies[54,57,58] ($n = 199$ randomised, 197 followed up) assessed CBT (one study;[54] 10 sessions) or computer-based CBT with brief weekly therapist input (two studies;[57,58] 10 sessions) (*Tables 22* and *23*). Comparators included psychoeducation (10 sessions; non-cannabis-based),[54] person-centred therapy (PCT; 10 sessions)[58] or brief MI (1 session).[57] Sessions were individualised (not group). Session attendance was reported as 76%,[54] 53%[58] and 76%[82] for the CBT interventions. For comparators, 84% attended all psychoeducation sessions,[54] 54% attended all sessions for PCT[58] and 87% participants attended all brief MI sessions.[82] Participants were classified as having low baseline use in all studies and all studies were conducted in Australia.

Main results

Two studies reported results post treatment. One study[54] reported no significant differences between CBT and psychoeducation (10 sessions each) post treatment or at 9 months' follow-up, but numbers of analysed participants were low; however, both groups showed a significant improvement from baseline, post treatment and at 9 months (based on one relevant outcome, number of days used). Another study[58] reported no significant difference between the three types of 10-session therapy (CBT, computer-delivered CBT with brief therapist input, or PCT) post treatment. Individual group comparisons were not reported, only the following comparisons: CBT or computer-delivered CBT compared with PCT, and computer-delivered CBT compared with CBT or PCT. Changes from baseline were not reported for this study.

A further study[57] reported that 10 sessions of either CBT or computer-delivered CBT with brief therapist input (analysed together) was significantly better than 1-session MI at 12 months' follow-up, and that there was a significant improvement from baseline across groups at 12 months; however, only one relevant outcome (mean use per day) was reported for this study.

Effects of intervention and population characteristics

Intervention and comparator groups were too heterogeneous to allow meaningful assessment of the effects of other study characteristics on results.

TABLE 22 Summary for CBT compared with other interventions (psychiatric population)

Comparison	Number of studies, number randomised (followed up), categorisation high *n*, low *n*	Intervention (number of sessions)	Computer (number of sessions)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
CBT vs. other	Three studies,[54,57,58] (see *Table 23*), *n* = 199 (197), low use (3)	CBT (10 sessions), compCBT + brief therapist (10 sessions)	Psychoeducation-10, CBT-10, PCT-10, brief MI-1	Three individual, 10–12 weeks	No significant difference: one study:[54] CBT vs. psychoeducation (10 sessions + TAU): no significant difference. One study:[58] CBT or compCBT vs. PCT; compCBT vs. CBT or PCT: no significant difference	Significant change: one study:[54] significant change, CBT and psychoeducation (single outcome)	9–12 months	No significant difference: one study:[54] CBT vs. psychoeducation (10 sessions + TAU): no significant difference at 9 months. Significant difference: one study:[57] CBT-10 or compCBT-10 significantly better than MI-1 (single outcome)	Significant change: one study:[54] significant change, CBT and psychoeducation at 9 months (single outcome). One study:[57] significant change across groups at 12 months (single outcome)

Brief MI-1, one-session brief MI; CBT-10, 10-session CBT; comp-CBT, computer-delivered CBT; PCT-10, 10-session person-centred therapy; psychoeducation-10, 10-session psychoeducation.

TABLE 23 Results per study for CBT compared with other interventions (psychiatric population)

Study, country, cannabis use, recruitment, mean age (range)	Intervention (number of sessions) (number of sessions attended), number randomised (followed up)	Computer (number of sessions), (mean number of sessions attended), number randomised (followed up)	Individual or group, duration	Post-treatment difference between groups	Post-treatment change from baseline	Follow-up	Follow-up difference between groups	Follow-up change from baseline
Edwards 2006[54] (CAP), Australia, low use (DSM-IV 49%), referral, 21 years (15–29 years)	CBT/MI + TAU (10), (7.6[a]), $n = 23$ (22)	Psychoeducation (non-cannabis) + TAU (10) (8.4[a]), $n = 24$ (23)	Individual, 12 weeks	No significant difference: • Days used, $p = 0.99$ • % using in prior month, $p = 0.87$ • Severity of dependence (CASUAS), $p = 0.99$ • Readiness to change, $p = 0.68$	Significant change: • Days used, $p < 0.001$ (both groups)	9 months	No significant difference: • Days used, $p = 0.84$ • % using in prior month, $p = 0.29$ • Severity of dependence (CASUAS), $p = 0.99$ • Readiness to change, $p = 0.72$	Change maintained after treatment end: • Days used, $p = 0.91$ • (All groups, treatment end to follow-up)
Kay-Lambkin 2011,[58] Australia, low use (≥ 4 day/month), voluntary + referral, 40 years (17–70 years)	compCBT/MI/brief therapist (10) (5.3[b]), total $n = 109$ (NR)	PCT (10) (5.4[b]), CBT/MI (10) (6.1[b]), ($n = 109$)	Individual, 10 weeks	No significant difference (CBT + compCBT vs. PCT): • % abstinent, $p = 0.164$ • 50% reduction in use, $p = 0.751$ • % using more than once weekly, $p = 0.685$ No significant difference (compCBT vs. CBT + PCT): • % abstinent, $p = 0.309$ • 50% reduction in use, $p = 0.582$ • % using more than once weekly, $p = 0.551$				
Kay-Lambkin 2009,[57] Australia, low use (≥ 4 day/month), voluntary + referral, 35 years (18–61 years)	compCBT/MI/brief therapist (10) (7.6[a]), total $n =$ NR (43)	Brief MI (1), CBT/MI (10) (8.7[a]), ($n =$ NR)	Individual, 10 weeks			12 months	Significant difference (CBT + compCBT vs. MI): • Mean cannabis per day, $p < 0.001$	Significant change: • Mean cannabis per day, $p < 0.001$ (across all groups)

CAP, Cannabis and Psychosis Therapy; CASUAS, Cannabis and Substance Use Assessment Schedule; comp-CBT, computer-delivered CBT.
a No significant difference between session attendance, $p = 0.20$.
b No significant difference between session attendance, $p = 0.353$.

Subgroup analyses: effect of intervention and population characteristics

This section provides a summary of the possible effects of intervention and population characteristics on results. These are covered in each of the intervention/comparator categories above and are summarised here.

Number of sessions, and comparison of longer cognitive–behavioural therapy, compared with shorter motivational interviewing

Two sets of data imply that longer courses of CBT may be somewhat more effective than shorter courses of MI, but findings were mixed. First, four studies directly compared CBT (6–14 sessions) against brief MI (1–4 sessions).[39,40,50,53] Of these, some showed better results for CBT than MI (one[39] post treatment, two at later follow-ups[39,53]), whereas others showed no significant differences (two[40,50] post treatment, one at later follow-ups[50]). Second, studies comparing brief MI with wait list showed some significant effects, but these were not as positive overall as results for CBT compared with wait list which were significant on nearly all outcomes. The somewhat better results for CBT than MI could be due to the nature of CBT treatment, the fact that more sessions were provided, or a combination of the two.

Within six studies of CBT compared with wait list,[39,50,53,59,60,63] all durations of CBT (4–14 sessions) appeared effective. There were slightly fewer significant effects in the study of four-session CBT,[63] but this may have been related to the small number of participants. One study[63] compared four sessions of CBT over either a 4- or 12-week period; post-treatment results significantly favoured 12-week treatment on some but not all outcomes. Within studies of brief MI compared with wait list, there was no clear difference between studies of one-session or two-session MI, with both durations showing mixed results.

Group or individual treatment

Of the 33 included studies, 27[39–48,51–55,57–63,66,68,70,71,75] provided individualised treatments, whereas three[49,67,69] provided group treatment and two[50,65] compared group with individual treatment (not reported for one).[56] There were insufficient group treatment studies within most intervention/comparator categories to meaningfully compare group with individual treatment. Within studies of CBT compared with wait list, the one study of group CBT[50] had similar positive outcomes to the five individual CBT studies. Within studies of CBT compared with brief MI, one study[50] showed little benefit of group CBT compared with individual MI, and studies of individual CBT compared with MI showed mixed results. Within studies of brief MI compared with wait list, studies of individual MI showed mixed results, whereas the one study[67] of group MI showed no significant effect; however only 1 session of MI was provided and results were not measured until 6 months and then only on one outcome (cannabis days of use). One study[65] directly compared individual with group CBT (4 sessions each), but only 17 cannabis users were analysed and only one relevant outcome reported (days abstinent); results non-significantly favoured individual CBT post treatment, but this effect was not maintained at 12 months. Overall, group treatment may possibly be less effective than individual treatment, but this is based on very limited data.

High compared with low baseline cannabis use/dependence

The impact of high or low baseline cannabis use/dependence could be assessed to some extent within certain intervention/comparator categories: CBT compared with wait list, computer-delivered/telephone-delivered CBT compared with other, and brief MI compared with wait list. Within each of these categories, studies with low baseline use[43,45,46,48,55,60,63,67,70,71] appeared slightly less likely to show significant differences on all outcomes than studies of high use.[39,50,51,53,59,61] However, this difference was not substantial or conclusive. This potential difference could be owing to the interventions having a greater effect on participants with higher baseline use/dependence, either because a greater effect could be demonstrated or because these participants may have been more motivated to reduce use; however, this conclusion should be treated with caution.

In addition, two studies with low baseline use reported subgroup effects.[45,48] One study[45] reported no significant difference between internet-based personalised feedback and the control group across all participants, but a significant difference for participants with a higher contemplation to change use or a family history of drug problems. Another study,[48] in which participants were not seeking treatment for their cannabis use, reported no significant difference between brief MI and AO across all participants, but significant differences for those with a desire to cease use.

Recruitment method (voluntary compared with referrals)

Among the 26 general population studies,[39–51,53,55,56,59–63,65,67,70,71,75] 16[40,42–44,47–50,51,53,55,61,62,67,70,75] used voluntary recruitment via advertisement, while four[45,46,60,71] used referrals and four[39,41,59,65] used a combination of voluntary and referrals (not reported for two studies[56,63]). Results for the general population studies showed no clear difference in results according to recruitment method, although this comparison is based on limited data. No clear difference was observed within studies of CBT compared with wait list (two voluntary,[50,53] one referral,[60] two combination;[39,59] all positive results) or within studies of brief MI compared with wait list (six voluntary,[43,48,50,51,53,67] three referral,[45,46,71] one combination;[39] all mixed results). Nevertheless, it should be noted that the majority of the general population studies recruited volunteers via advertisement and, therefore, may reflect a more motivated group when compared with the 'average' cannabis user.

In contrast to the general population studies, all seven studies in psychiatric populations recruited patients via referral (four studies[52,54,66,68]) or a combination of referral and voluntary methods (three studies[57,58,69]). Across four studies of CBT plus TAU compared with TAU in psychiatric populations, three studies[52,66,68] used referrals and one[69] used a combination of voluntary and referrals; all four showed little difference between CBT plus TAU and TAU alone. Comparisons within the other three studies[54,57,58] were too heterogeneous to assess the effects of recruitment method.

Participant age

Within most intervention/comparator categories, mean ages were similar across studies, so the effect of age could not be meaningfully assessed. This was true for comparisons of CBT compared with wait list (mean age 24–36 years), CBT compared with brief MI (mean age 32–36 years), telephone-/internet-delivered CBT (mean age 25–36 years) and CBT plus TAU vs. TAU (mean age 26–29 years). For brief MI compared with wait list (10 studies[39,43,45,46,48,50,51,53,67,71]), mean age ranged from 18 years to 36 years. Five studies[43,45,46,48,67] assessed relatively young populations (mean age 18–23 years, upper age range in teens or twenties) and these studies were all classed as low baseline use/dependence. There were no clear differences in effects according to age, with the five studies of younger populations showing mixed results in a similar manner to other studies.

Baseline use of other substances

There were insufficient data to assess the effect of baseline alcohol and tobacco use; these were only reported in ten studies (alcohol)[39–41,44,51,54,55,59,60,63] and two studies (tobacco)[55,60] and were reported via very different measures (see *Tables 1* and *2*).

Chapter 4 Discussion

Statement of principal findings

General population studies

Of 26 studies[39–51,53,55,56,59–63,65,67,70,71,75] assessing the general population of cannabis users (7643 randomised participants), 16[40,42–44,47–50,51,53,55,61,62,67,70,75] recruited via advertisement and eight[39,41,45,46,59,60,65,71] via referrals or both. Baseline use/dependence was high in 13 studies[39–42,44,47,49–51,53,56,59,61] and low in 10.[43,45,46,48,55,60,63,65,70,75] Across six studies[39,50,53,59,60,63] of CBT (4–14 sessions) compared with wait list, CBT was significantly better on most outcomes (cannabis use, severity of dependence, cannabis problems) post treatment (in all five studies[39,50,59,60,63] with data) and at 9 months (in the one study[53] with later follow-up). Four studies[39,40,50,53] comparing CBT (6–14 sessions) with briefer MI/MET (1–4 sessions) gave mixed results, with two studies[40,50] showing better results for CBT post treatment and at 9–16 months, while two further studies[39,53] showed few between-group differences; both CBT and MI gave significant improvements from baseline. In one small study,[56] supportive–expressive dynamic psychotherapy (16 sessions) gave significant improvements over one-session MI. One study[49] of CBT compared with social support group (10 sessions each) and another[44] of CBT compared with 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-delivered CBT, internet-delivered CBT and internet-delivered counselling all showed significant improvements over wait list or education control post treatment and at 3 months.[55,61,70]

Ten studies[39,43,45,46,48,50,51,53,67,71] assessing brief MI/MET (one or two sessions) compared with wait list or 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[51,62,75] comparing brief MI against education controls. Five studies[40–42,44,47] assessed contingency management (monetary vouchers for abstinence). Vouchers alone and CBT plus vouchers gave better results than CBT or MET alone post treatment (three studies[40,42,44]), while at 14–15 months positive results were maintained for CBT plus vouchers but less so for vouchers alone (two studies[41,44]).

Psychiatric population studies

Seven studies[52,54,57,58,66,68,69] (525 randomised participants) assessed psychiatric populations (schizophrenia, psychosis, bipolar disorder or major depression); all recruited via referrals or referrals plus advertisements. Baseline use/dependence was high in three studies[66,68,69] and low in four.[52,54,57,58] Across four studies[52,66,68,69] assessing CBT (6–24 sessions) plus TAU compared with TAU alone, there were few significant between-group differences post treatment and none at 10–12 months (small studies; limited data), with little change from baseline in either group. Two studies[54,58] reported no significant difference between different types of 10-session therapy (one compared CBT, computer-delivered CBT and PCT; the other compared CBT and psychoeducation), although the latter reported significant improvements from baseline in both groups (limited data).[54] A further study reported improvements for 10-session CBT or computer-delivered CBT over single-session MI at 12 months' follow-up on one outcome (daily cannabis use).[57]

Strengths and limitations of the assessment

Strengths

This report systematically reviews the evidence for a range of psychological and psychosocial treatments for regular users of cannabis. Thirty-three studies were included and the scope of the review is inclusive, covering a wide range of populations, interventions and outcomes. The majority of previous reviews in this topic area have restricted their scope to a subtype of intervention or population, or are not specific to cannabis users.[6,33] The present review has included all psychosocial or psychological interventions undertaken in the adult, community-dwelling population of cannabis users and has only included RCTs, ensuring that only the highest quality available evidence has been included. Robust methods were used, including a search methodology with wide scope, grey literature searching and contact with clinical experts in the area. Data were double-checked for accuracy.

The included studies reported a heterogeneous set of data; in many cases, similar outcome measures (e.g. cannabis use) were reported in different ways. Narrative synthesis was used to analyse and explore the data. Results are presented for each intervention/comparator category (e.g. CBT vs. wait list or CBT vs. MI) and by population (general vs. psychiatric). This allows studies with similar comparisons and populations to be analysed together, to provide an overview of the direction of effects for each category at different time points. This approach also minimises loss of data, as any meta-analysis would have been restricted to studies reporting the same outcome in a consistent format and reporting full data [including standard deviations (SDs), etc.].

Limitations

There was substantial heterogeneity between studies in terms of their populations, interventions, comparators, outcome measures and data format, and limited time was available to conduct this systematic review short report. Therefore, results are presented as an overview of the outcomes reported per study and how many showed a significant difference, both between intervention groups and in terms of changes from baseline, at different follow-up time points. Detailed numerical results per group are not presented in the main results section (these are provided in *Appendix 4*) and meta-analysis was not undertaken. This approach has the limitations that (1) it was not possible to present effect sizes for outcomes and (2) data were not pooled across studies. However, the narrative synthesis approach was thought to provide benefits in terms of interpretability as described above. In addition, owing to time constraints, we were unable to include studies written in languages other than English.

Only RCTs were included in this review. Although this ensures that only the highest quality of evidence is included in the synthesis, it does potentially result in informative studies being rejected. Nine potentially relevant articles were excluded owing to this;[83–91] however, most of these studies would have been rejected for other exclusion criteria (four of the studies included a population comprising people aged < 18 years).[84,88,90,91]

We excluded studies that were undertaken within the criminal justice setting (e.g. studies undertaken within the court system, prison, or while study participants are on parole). We also excluded studies that treated individuals other than the cannabis user (e.g. a family member). Although risking the exclusion of potentially valid trials, excluding these populations reduced the many sources of heterogeneity. This review focused on community-delivered interventions. Interventions carried out within the criminal justice setting are unlikely to be replicable when delivered to cannabis users outside that setting, owing to differences in recruitment, intervention delivery and outcome assessment.

The studies included in this review utilised a variety of recruitment methods, involving voluntary recruitment, referral by a health-care professional or a combination of both. Studies in the general population of cannabis users mostly used voluntary recruitment methods (most often via advertisements); therefore, these may have reflected more motivated populations and may not be generalisable to all cannabis users. Conversely, this may reflect practice in that psychological interventions are likely to be provided to those willing to receive them. In addition, the included studies recruited cannabis users with varying frequencies of cannabis use at baseline.

Results obtained from the psychiatric population studies may have been affected by provision of TAU to both groups, which in two studies included psychosocial interventions.[68,69] Although these presumably focused on the psychiatric condition rather than cannabis use, they may indirectly have affected cannabis outcomes in both groups. Another study provided a self-help book on substance abuse as part of TAU.[52]

The following topics are outside the scope of this systematic review, but could form aspects of future work in this area. Although this short report focused on treatment of adult cannabis users, there is a large amount of literature on treatment of cannabis use in adolescents, including the effects of preventative strategies as well as interventions involving families or schools. In addition, assessment of the effects of factors such as therapist type and treatment fidelity, which are important factors when considering psychosocial interventions, may form a part of future reviews.

Assessment of factors relevant to the National Health Service and other parties

It would be important to consider the following points relating to implementation of any psychosocial intervention for cannabis use.

Intervention delivery

- Availability of CBT and other treatments within the NHS, and which type of health professional would provide these. Department of Health guidance suggests that psychosocial interventions for substance misuse may be delivered by a key worker (when a health professional works with the individual to ensure delivery and ongoing review of care being received) with the required competencies or by a drug worker or psychologist.[20]
- UK guidelines also emphasise the importance of person-centred care, consideration of family and carer involvement, links between services to avoid loss of contact and importance of key working.[19,20] They also advise that treatment and information should be accessible to people with disabilities and to those who do not speak or read English.[19]

Patient identification

- How cannabis users would be identified/diagnosed and referred for treatment (e.g. via a general practitioner, social worker or a variety of routes).
- The level of cannabis use or dependence at which treatment is required.
- Whether all patients with a particular level of use or dependence would be referred or, for example, only those who wished to receive a psychosocial intervention and/or those expressing a desire to reduce or cease use (note that the majority of data for 'general population' studies involved participants voluntarily responding to advertisements). Existing UK guidelines advise that service users should be allowed to make informed decisions about their treatment in partnership with their health professionals.[19]

- Other relevant interventions exist that do not explicitly target cannabis users, but are aimed at individuals with addictive behaviours. Although no relevant RCTs of such therapies were identified in this review, they may be worthy of further consideration or research. For example, mutual aid therapies (such as Self-Management and Recovery Training) involve people with similar experiences assisting each other to overcome or manage their issues. Department of Health guidance advises that self-help and mutual aid groups should be recommended for all drug misusers seeking to achieve and maintain abstinence.[20] Other interventions not within the scope of this review may increase the effectiveness of psychosocial or psychological interventions for cannabis cessation. For example, nicotine replacement therapy may increase the ability of regular cannabis users to reduce their use of the drug, although a recently conducted pilot study found that this was not the case for a group of 12 cannabis-dependent individuals.[92]

Comparison of results from this review with relevant national guidelines

- Existing UK guidelines from NICE advise that CBT should not be offered routinely for treatment of cannabis abuse. Department of Health guidance advises that brief motivational interventions may be considered in mild cases of cannabis use, whereas more heavily dependent users may require structured treatment with key working.[19,20] Our review found that CBT appeared effective for routine treatment of cannabis abuse, but it was unclear how much more effective it was than briefer interventions.
- In terms of people with co-existing psychiatric conditions, NICE and Department of Health guidelines suggest that CBT should be considered for treatment of cannabis users with comorbid depression and anxiety disorders.[19,20] Our review found that studies with people suffering from psychological conditions appeared to show less promising effects of CBT,[52,54,57,58,66,68,69] but we focused on studies of CBT aimed at treating the cannabis abuse rather than the psychological condition and these studies may have been confounded by both groups receiving TAU for the psychological condition (including psychosocial treatments in some cases).[52,66,68,69]

Chapter 5 Conclusions

Implications for service provision

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 (which differed in cannabis use at baseline as well as presence or absence of a psychiatric condition) and the outcomes measured (differing in metrics used, statistics reported and follow-up periods). Studies recruited participants using either voluntary or direct referral methods – studies utilising voluntary recruitment methods identified a self-selecting population, which may not be representative of real-world cannabis users.[39–44,47–50,53,55,61,62,67,70,75] In addition, 24 of the studies were deemed to be at high risk of bias, mostly owing to high attrition rates.[40,41,43,48,49,52–55,57–63,65,67–71,75,81] No studies were deemed to be at low risk of bias.

In light of the above, it is difficult to make definite conclusions regarding the effectiveness of the included psychological and psychosocial interventions. Based on the available evidence, CBT (4–14 sessions) appeared to significantly improve outcomes post treatment (cannabis use, severity of dependence, cannabis problems) compared with wait list in the general population of cannabis users, but only one[53] of the six[39,50,53,59,60,63] studies reported outcomes at a follow-up time point significantly after the treatment period elapsed. Studies of brief MI/MET (one or two sessions) gave mixed results, with some improvements over wait list, whereas some comparisons were not significant. Comparisons of CBT (6–14 sessions) with briefer MI/MET (1–4 sessions) also gave mixed results, with longer courses of CBT providing some improvements over MI. Significant effects were maintained in two[39,53] of the three[39,50,53] studies reporting later follow-ups. Courses of other types of therapy (social support group, case management, supportive–expressive dynamic psychotherapy) gave similar improvements to CBT based on limited data. Limited data indicated that telephone- or internet-based interventions may also be effective. Contingency management (vouchers for abstinence) gave promising results in the short term; at later follow-ups vouchers in combination with CBT gave better results than either vouchers or CBT alone. There were insufficient data to assess the effects of group compared with individual treatment.

In populations with psychiatric conditions (schizophrenia, psychosis, bipolar disorder or major depression), CBT appeared to have little effect over TAU, but this was based on four small studies with limited data.[52,66,68,69] Results may potentially have been affected by provision of TAU in both groups and the fact that patients were referred rather than volunteering for treatment. Other studies reported no significant difference between 10 sessions of CBT, computer-delivered CBT, PCT or psychoeducation, but improvements for 10-session CBT or computer-delivered CBT over single-session MI.

Included studies were heterogeneous and most were considered at high risk of bias. Based on the available evidence, courses of CBT and (to a lesser extent) one or two sessions of MI improved outcomes in a self-selected population of cannabis users. 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. Results of CBT for cannabis cessation in psychiatric populations were less promising, but may have been affected by provision of TAU in both groups and the referred populations.

Suggested research priorities

The highest priority area for future research should be to identify the number and frequency of sessions required to provide reductions in cannabis use, which was unclear from the identified evidence. CBT (4–14 sessions) gave improved outcomes over wait list in general population studies, whereas briefer MI-based interventions (one or two sessions) appeared to have some effectiveness, although results were mixed. CBT also appeared to give somewhat better results than briefer MI-based interventions; however, it was unclear to what extent CBT outcomes were better. Future studies may wish to assess further the effectiveness of shorter courses of therapy. This could include brief interventions (e.g. one or two sessions). Alternatively, because studies of four- or six-session CBT seemed to have similar effectiveness to studies with 10–14 sessions, further assessment of four- to six-session CBT may be worthwhile. Relative cost-effectiveness of longer and shorter interventions may also be useful to assess. If shorter interventions are as efficacious and more cost-effective than longer ones, the former could be made more widely available.

The following areas for future research do not have as high priority, but are important nonetheless. They do not have any order of importance in relation to each other.

Interventions

Future studies may wish to test other interventions in addition to CBT. The use of contingency management (vouchers for abstinence) improved long-term outcomes when added to CBT. Future studies assessing CBT (and/or brief interventions) may also wish to include a group receiving CBT and contingency management. In addition, mutual aid therapies and self-help groups (for which no RCTs were identified in this review) may be worthy of future study. Other treatments not within the scope of this review, such as nicotine replacement therapy, could be assessed in conjunction with psychological and psychosocial interventions in order to increase effectiveness. All studies should aim to report the included interventions in sufficient detail to allow replication.

The current review has identified that CBT may be effective when delivered to cannabis-dependent individuals, but effectiveness has not been demonstrated when such treatment is provided to patients with psychological comorbidities. This lack of effectiveness for the dually diagnosed population confirms findings from a previous review.[6] These findings suggest that patients with a dual diagnosis may require separate treatments for their substance abuse and psychological problem. Alternatively, if this lack of effectiveness in the dually diagnosed population was due to the participant themselves being unable to respond to the CBT treatment owing to their psychological condition, further research may be necessary to identify interventions that are effective in such populations.

Populations

Future studies may also wish to consider the potential effects of recruitment method. Most existing general population studies recruited via advertisement. Studies using other methods of recruitment may be more generalisable to a clinical setting. Conversely, a somewhat selected study population may be reasonable (e.g. those wishing to cease use and/or willing to receive the intervention) as current guidance suggests that these populations would be the most relevant to receive psychosocial interventions (as opposed to, for example, users expressing no desire to cease use).

The included studies did not report the effect of the psychopharmacology of cannabis. Recent findings indicate that certain strains of cannabis containing high levels of cannabidiol are associated with less cognitive impairment and positive therapeutic potential in psychosis and other disorders (such as Parkinson's disease).[93–96] This pharmacological factor could be an important modulating factor in treatment outcomes and, therefore, should be taken into account in future studies.

Outcomes

Outcomes reported in most studies could be classified into four main groups: (1) level of attendance, (2) cannabis use, (3) severity of dependence and (4) cannabis-related problems. Cannabis use covered a range of specific outcomes including point abstinence rates, abstinence over a specified period, number of days using cannabis or number of days abstinent (over a specified period), amount of cannabis use per day, and number of periods of use per day (e.g. of four daily periods). All the above outcomes showed significant effects in at least some studies. Future studies may wish to consider which outcomes have been most commonly used in existing studies making similar comparisons, to improve comparability between studies. In terms of the above outcomes, level of cannabis use can be difficult to measure owing to the different levels of active ingredients in different cannabis products. Abstinence is a frequently used outcome but may not be desirable or attainable for all users. Severity of dependence addresses the impact on a person's life rather than focusing on quantities of use. Cannabis-related problems may also be a useful measure but in populations with other issues (such as psychiatric conditions) it may be difficult to distinguish between the causes of problems. Patient preference for different types of psychological intervention may also be useful to assess.

Methodology

Future studies should carefully consider trial methodology. The studies included in this review utilised a range of comparison groups, including active treatments (e.g. a variation of CBT or MI), less specific controls for time and attention (e.g. cannabis education) and inactive controls (wait list or AO). We recommend that wait list controls are included as a group in future studies, even those comparing different types or durations of active treatments, to indicate whether or not active treatments are effective when compared with no treatment (as well as with each other).

In addition, it would be useful to consider carefully future study designs for populations with psychiatric conditions. If TAU (for the psychiatric condition) is provided to all groups, this should be reflective of current clinical practice and consideration should be given to whether or not it may confound the study intervention (e.g. whether or not it includes psychosocial interventions). It may also be worth considering whether or not a single psychosocial intervention can be tailored to address jointly both the psychiatric condition and cannabis use.

The studies included in this review followed up participants over various time periods, ranging, overall, between 12 weeks and 16 months. Future studies should aim to follow-up patients over the long term; wait list controls with long-term follow-up are also valuable to assess fully long-term effects of treatment; however, this needs to be balanced against ethics considerations and acceptability to trial participants.

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About the School of Health and Related Research

The ScHARR is one of the nine departments that constitute the Faculty of Medicine, Dentistry and Health at the University of Sheffield, Sheffield, UK. ScHARR specialises in health services and public health research, the application of health economics and decision science to the development of health services and the improvement of public health.

The ScHARR Technology Assessment Group (ScHARR-TAG) synthesises research on the clinical effectiveness and cost-effectiveness of health-care interventions for the NIHR HTA programme on behalf of a range of policy-makers, including the NICE. ScHARR-TAG is part of a wider collaboration of a number of units from other regions including Southampton Health Technology Assessment Centre (SHTAC), University of Southampton, Southampton, UK; Aberdeen HTA Group, University of Aberdeen, Aberdeen, UK; Liverpool Reviews and Implementation Group (LRiG), University of Liverpool, Liverpool, UK; Peninsular Technology Assessment Group (PenTAG), University of Exeter, Exeter, UK; the NHS Centre for Reviews and Dissemination, University of York, York, UK; Warwick Evidence, University of Warwick, Coventry, UK; the BMJ Group and Kleijnen Systematic Reviews.

Contributions of authors

Katy Cooper and **Robin Chatters** carried out the systematic review and quality assessment of the studies.

Eva Kaltenthaler provided methodological input.

Ruth Wong carried out the literature searches.

All authors contributed to the drafting of the report.

Data sharing statement

All data available are included as an appendix to the report.

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60. Hoch E, Buhringer G, Pixa A, Dittmer K, Henker J, Seifert A, *et al.* CANDIS treatment program for cannabis use disorders: Findings from a randomized multi-site translational trial. *Drug Alcohol Depend* 2014;**134**:185–93. http://dx.doi.org/10.1016/j.drugalcdep.2013.09.028

61. Tossmann HP, Jonas B, Tensil MD, Lang P, Strüber E. A controlled trial of an internet-based intervention program for cannabis users. *Cyberpsychol Behav Social Network* 2011;**14**:673–9. http://dx.doi.org/10.1089/cyber.2010.0506

62. Fernandes S, Ferigolo M, Benchaya MC, Moreira TC, Pierozan PS, Mazoni CG, *et al.* Brief Motivational Intervention and telemedicine: a new perspective of treatment to marijuana users. *Addict Behav* 2010;**35**:750–5. http://dx.doi.org/10.1016/j.addbeh.2010.03.001

63. Jungerman FS, Andreoni S, Laranjeira R. Short term impact of same intensity but different duration interventions for cannabis users. *Drug Alcohol Depend* 2007;**90**:120–7. http://dx.doi.org/10.1016/j.drugalcdep.2007.02.019

64. Fischer B, Dawe M, McGuire F, Shuper PA, Capler R, Bilsker D, *et al.* Feasibility and impact of brief interventions for frequent cannabis users in Canada. *J Subst Abuse Treat* 2013;**44**:132–8. http://dx.doi.org/10.1016/j.jsat.2012.03.006

65. Sobell LC, Sobell MB, Agrawal S. Randomized controlled trial of a cognitive-behavioral motivational intervention in a group versus individual format for substance use disorders. *Psychology Addict Behav* 2009;**23**:672–83. http://dx.doi.org/10.1037/a0016636

66. Bonsack C, Gibellini MS, Favrod J, Montagrin Y, Besson J, Bovet P, *et al.* Motivational intervention to reduce cannabis use in young people with psychosis: a randomized controlled trial. *Psychother Psychosom* 2011;**80**:287–97. http://dx.doi.org/10.1159/000323466

67. Gmel G, Gaume J, Bertholet N, Fluckiger J, Daeppen JB. Effectiveness of a brief integrative multiple substance use intervention among young men with and without booster sessions. *J Subst Abuse Treat* 2013;**44**:231–40. http://dx.doi.org/10.1016/j.jsat.2012.07.005

68. Hjorthoj CR, Fohlmann A, Larsen AM, Gluud C, Arendt M, Nordentoft M. Specialized psychosocial treatment plus treatment as usual (TAU) versus TAU for patients with cannabis use disorder and psychosis: the CapOpus randomized trial. *Psychol Med* 2013;**43**:1499–510. http://dx.doi.org/10.1017/S0033291712002255

69. Madigan K, Brennan D, Lawlor E, Turner N, Kinsella A, O'Connor JJ, *et al.* A multi-center, randomized controlled trial of a group psychological intervention for psychosis with comorbid cannabis dependence over the early course of illness. *Schizophr Res* 2013;**143**:138–42. http://dx.doi.org/10.1016/j.schres.2012.10.018

70. Rooke S, Copeland J, Norberg M, Hine D, McCambridge J. Effectiveness of a self-guided web-based cannabis treatment program: randomized controlled trial. *J Med Internet Res* 2013;**15**:e26. http://dx.doi.org/10.2196/jmir.2256

71. Humeniuk R, Ali R, Babor T, Souza-Formigoni ML, de Lacerda RB, Ling W, *et al.* A randomized controlled trial of a brief intervention for illicit drugs linked to the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) in clients recruited from primary health-care settings in four countries. *Addiction* 2012;**107**:957–66. http://dx.doi.org/10.1111/j.1360-0443.2011.03740.x

72. Litt MD, Kadden RM, Stephens RS, Marijuana Treatment Project Research Group. Coping and self-efficacy in marijuana treatment: results from the marijuana treatment project. *J Consult Clin Psychol* 2005;**73**:1015–25. http://dx.doi.org/10.1037/0022-006X.73.6.1015

73. ClinicalTrials.gov. *Development and Efficacy Test of Computerized Treatment for Marijuana Dependence*. 2013. URL: https://clinicaltrials.gov/show/NCT00594659 (accessed 6 February 2014).

74. Moore BA, Budney AJ. Relapse in outpatient treatment for marijuana dependence. *J Subst Abuse Treat* 2003;**25**:85–9. http://dx.doi.org/10.1016/S0740-5472(03)00083-7

75. Fischer B, Jones W, Shuper P, Rehm J. 12-month follow-up of an exploratory 'brief intervention' for high-frequency cannabis users among Canadian university students. *Subst Abuse Treat Prev Policy* 2012;**7**:15. http://dx.doi.org/10.1186/1747-597X-7-15

76. Hoch E, Noack R, Henker J, Rohrbacher H, Pixa A, Buhringer G, *et al.* Tailoring CBT to problem profiles of patients with cannabis use disorders. *Sucht* 2008;**54**:306.

77. Litt MD, Kadden RM, Kabela-Cormier E, Petry NM. Coping skills training and contingency management treatments for marijuana dependence: exploring mechanisms of behavior change. *Addiction* 2008;**103**:638–48. http://dx.doi.org/10.1111/j.1360-0443.2008.02137.x

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79. DeMarce JM, Stephens RS, Roffman RA. Psychological distress and marijuana use before and after treatment: testing cognitive–behavioral matching hypotheses. *Addict Behav* 2005;**30**:1055–9. http://dx.doi.org/10.1016/j.addbeh.2004.09.009

80. Hjorthoj C, Fohlmann A, Mette LA, Gluud C, Arendt M, Nordentoft M. CapOpus-intervention study for cannabis use disorder in psychosis. *Early Interv Psychiatry* 2012;**6**:28.

81. Budney AJ, Fearer S, Walker DD, Stanger C, Thostenson J, Grabinski M, *et al.* An initial trial of a computerized behavioral intervention for cannabis use disorder. *Drug Alcohol Depend* 2011;**115**:74–9. http://dx.doi.org/10.1016/j.drugalcdep.2010.10.014

82. Kay-Lambkin FJ, Baker AL, Kelly BJ, Lewin TJ. It's worth a try: The treatment experiences of rural and Urban participants in a randomized controlled trial of computerized psychological treatment for comorbid depression and alcohol/other drug use. *J Dual Diagn* 2012;**8**:262–76. http://dx.doi.org/10.1080/15504263.2012.723315

83. Gaudiano BA, Weinstock LM, Miller IW. Improving treatment adherence in patients with bipolar disorder and substance abuse: Rationale and initial development of a novel psychosocial approach. *J Psychiatr Pract* 2011;**17**:5–20. http://dx.doi.org/10.1097/01.pra.0000393840.18099.d6

84. Hides LM, Elkins KS, Scaffidi A, Cotton SM, Carroll S, Lubman DI, *et al.* Does the addition of integrated cognitive behaviour therapy and motivational interviewing improve the outcomes of standard care for young people with comorbid depression and substance misuse? *Med J Aust* 2011;**195**:S31–7.

85. Lykke J, Oestrich I, Austin SF, Hesse M. The implementation and evaluation of cognitive milieu therapy for dual diagnosis inpatients: A pragmatic clinical trial. *J Dual Diagn* 2010;**6**:58–72. http://dx.doi.org/10.1080/15504260903498763

86. McLellan AT. A randomized controlled trial of brief cognitive–behavioral interventions for cannabis use disorder. *J Subst Abuse Treat* 2001;**21**:65–6. http://dx.doi.org/10.1016/S0740-5472(01)00196-9

87. Miller WR. It all depends. *Addiction* 2008;**103**:1819–20. http://dx.doi.org/10.1111/j.1360-0443.2008.02359.x

88. Naar-King S. Motivational interviewing in adolescent treatment. *Can J Psychiatry* 2011;**56**:651–7.

89. Nery FG, Soares JC. Comorbid bipolar disorder and substance abuse: Evidence-based options. *Curr Psychiatry* 2011;**10**:57–66.

90. Pokhrel P, Sussman S, Rohrbach LA, Sun P. Prospective associations of social self-control with drug use among youth from regular and alternative high schools. *Subst Abuse Treat Prev Policy* 2007;**2**:22. http://dx.doi.org/10.1186/1747-597X-2-22

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92. Hill KP, Toto LH, Lukas SE, Weiss RD, Trksak GH, Rodolico JM, *et al.* Cognitive behavioral therapy and the nicotine transdermal patch for dual nicotine and cannabis dependence: a pilot study. *Am J Addict* 2013;**22**:233–8. http://dx.doi.org/10.1111/j.1521-0391.2012.12007.x

93. Englund A, Morrison PD, Nottage J, Hague D, Kane F, Bonaccorso S, *et al.* Cannabidiol inhibits THC-elicited paranoid symptoms and hippocampal-dependent memory impairment. *J Psychopharmacol* 2013;**27**:19–27. http://dx.doi.org/10.1177/0269881112460109

94. Morgan CJ, Schafer G, Freeman TP, Curran HV. Impact of cannabidiol on the acute memory and psychotomimetic effects of smoked cannabis: naturalistic study: naturalistic study. *Br J Psychiatry* 2010;**197**:285–90. http://dx.doi.org/10.1192/bjp.bp.110.077503

95. Leweke FM, Piomelli D, Pahlisch F, Muhl D, Gerth CW, Hoyer C, *et al.* Cannabidiol enhances anandamide signaling and alleviates psychotic symptoms of schizophrenia. *Transl Psychiatry* 2012;**2**:e94. http://dx.doi.org/10.1038/tp.2012.15

96. Chagas MH, Eckeli AL, Zuardi AW, Pena-Pereira MA, Sobreira-Neto MA, Sobreira ET, *et al.* Cannabidiol can improve complex sleep-related behaviours associated with rapid eye movement sleep behaviour disorder in Parkinson's disease patients: a case series. *J Clin Pharm Ther* 2014;**39**:564–6. http://dx.doi.org/10.1111/jcpt.12179

97. PRISMA. *The PRISMA Statement*. URL: www.prisma-statement.org (accessed 29 November 2013).

Appendix 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist

Section/topic	Number	Checklist item	Reported on page number
Title			
Title	1	Identify the report as a systematic review, meta-analysis, or both	1
Abstract			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number	xxi–xxiv
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known	1–3
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS)	5
Methods			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale	7–10
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched	7
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated	93, 94
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis)	9
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators	9
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made	8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis	9, 10
Summary measures	13	State the principal summary measures (e.g., RR, difference in means)	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis	9

Section/topic	Number	Checklist item	Reported on page number
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies)	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified	9
Results			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram	11
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations	11–20
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12)	20
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot	26–72
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15)	21, 22
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16])	71, 72
Discussion			
Summary of evidence	24	Summarise the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., health-care providers, users, and policy makers)	73
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias)	74, 75
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research	77–79
Funding			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review	iii

N/A, not applicable.

Appendix 2 Literature search strategies

The following strategy was developed for use in MEDLINE. This strategy was subsequently translated in accordance with the other databases searched.

MEDLINE search strategy

1. Substance-Related Disorders/
2. (cannabis$ or marijuana or marihuana or hashish).ab,ti.
3. 1 and 2
4. exp marijuana abuse/
5. ((cannabis$ or marijuana or marihuana or hashish) adj2 (misuse or abuse$ or addict$ or depend$ or disorder$ or use$)).ab,ti.
6. or/3-5
7. ((cannabis$ or marijuana or marihuana or hashish) adj3 (therap$ or treatment$)).ab,ti.
8. (cessation adj2 (therap$ or treat$)).ab,ti.
9. exp psychotherapy/
10. psychotherap$.ab,ti.
11. ((psychodynamic or psychosocial) adj2 (therap$ or treatment$ or intervention$ or program$)).ab,ti.
12. exp Behavior Therapy/
13. ((behavio$ or cognitive$) adj3 (therap$ or treatment$ or management or intervention$ or program$)).ab,ti.
14. cbt.ab,ti.
15. exp Counseling/
16. counsel$.ab,ti.
17. exp Mind-Body Therapies/
18. ((relaxation or imagery) adj2 (therap$ or technique$)).ab,ti.
19. (guided adj2 imagery).ab,ti.
20. biofeedback.ab,ti.
21. (family adj2 therap$).ab,ti.
22. (motivation$ adj3 (therap$ or interview$)).ab,ti.
23. ((case or contingency) adj2 (therap$ or management)).ab,ti.
24. ((coping skill$ or cbst or self control or assertive$) adj2 (training or therap$)).ab,ti.
25. aversi$ therap$.ab,ti.
26. covert sensiti?ation.ab,ti.
27. or/7-26
28. 6 and 27
29. meta-analysis as topic/
30. (meta analy$ or metaanaly$).tw.
31. Meta-Analysis/
32. (systematic adj (review$1 or overview$1)).tw.
33. "Review Literature as Topic"/
34. or/29-33
35. (cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or cinhal or science citation index or bids or cancerlit).ab.
36. ((reference adj list$) or bibliograph$ or hand-search$ or (relevant adj journals) or (manual adj search$)).ab.
37. ((selection adj criteria) or (data adj extraction)).ab.
38. "review"/
39. 37 and 38
40. comment/ or editorial/ or letter/

41. Animals/
42. Humans/
43. 41 not (41 and 42)
44. 40 or 43
45. 34 or 35 or 36 or 39
46. 45 not 44
47. 28 and 46
48. Randomized controlled trials as Topic/
49. Randomized controlled trial/
50. Random allocation/
51. randomized controlled trial.pt.
52. Double blind method/
53. Single blind method/
54. Clinical trial/
55. exp Clinical Trials as Topic/
56. controlled clinical trial.pt.
57. clinical trial$.pt.
58. multicenter study.pt.
59. or/48-58
60. (clinic$ adj25 trial$).ti,ab.
61. ((singl$ or doubl$ or treb$ or tripl$) adj (blind$ or mask$)).tw.
62. Placebos/
63. Placebo$.tw.
64. randomly allocated.tw.
65. (allocated adj2 random).tw.
66. or/60-65
67. 59 or 66
68. Case report.tw.
69. Letter/
70. Historical article/
71. 68 or 69 or 70
72. exp Animals/
73. Humans/
74. 72 not (72 and 73)
75. 71 or 74
76. 67 not 75
77. 28 and 76

Appendix 3 Table of excluded studies with rationale

Author and year	Reason for exclusion
Azrin NH, McMahon PT, Donohue B, Besalel VA, Lapinski KJ, Kogan ES, *et al.* Behavior therapy for drug abuse: a controlled treatment outcome study. *Behav Res Ther* 1994;**32**:857–66	No relevant outcomes
Barrowclough C, Haddock G, Beardmore R, Conrod P, Craig T, Davies L, *et al.* Evaluating integrated MI and CBT for people with psychosis and substance misuse: Recruitment, retention and sample characteristics of the MIDAS trial. *Addict Behav* 2009;**34**:859–66	No relevant outcomes
Barrowclough C, Haddock G, Wykes T, Beardmore R, Conrod P, Craig T, *et al.* Integrated motivational interviewing and cognitive behavioural therapy for people with psychosis and comorbid substance misuse: randomised controlled trial. *BMJ* 2010;**341**:c6325	No relevant outcomes
Barrowclough C, Lobbanl F, Warburton J, Choudhry I, Gregg L, Wood H, *et al.* HELPER ReCAP: Rethinking Choices after Psychosis – a phase-specific psychological therapy for people with problematic cannabis use following a first episode of psychosis. *Early Interv Psychiatry* 2010;**4**(Suppl. 1):161	No relevant outcomes
Bellack AS, Bennett ME, Gearon JS, Brown CH, Yang Y, Bellack AS, *et al.* A randomized clinical trial of a new behavioral treatment for drug abuse in people with severe and persistent mental illness. *Arch Gen Psychiatry* 2006;**63**:426–32	No relevant outcomes
Bernstein E, Edwards E, Dorfman D, Heeren T, Bliss C. Screening and brief intervention to reduce marijuana use among youth and young adults in a pediatric emergency department. *Acad Emerg Med* 2009;**16**:1174–85	Not relevant population
Bond GR, McDonel EC, Miller LD, Pensec M. Assertive community treatment and reference groups: an evaluation of their effectiveness for young adults with serious mental illness and substance abuse problems. *Psychosoc Rehabil J* 1991;**15**:31–43	No relevant outcomes
Brooks AJ, Penn PE. Comparing treatments for dual diagnosis: twelve-step and self-management and recovery training. *Am J Drug Alcohol Abuse* 2003;**29**:359–83	No relevant outcomes
Brown TG, Seraganian P, Tremblay J, Annis H. Process and outcome changes with relapse prevention versus 12-step aftercare programs for substance abusers. *Addiction* 2002;**97**:677–89	No relevant outcomes
Buckner JD, Carroll KM. Effect of anxiety on treatment presentation and outcome: results from the Marijuana Treatment Project. *Psychiatry Res* 2010;**178**:493–500	No relevant outcomes
Budney AJ, Moore BA, Rocha H. Abstinence-based vouchers delivered without psychotherapy increase abstinence during treatment for marijuana dependence. *Drug Alcohol Depend* 2001;**63**(Suppl. 1):21	No relevant outcomes
Campbell AN, Nunes EV, McClure EA, Hu MC, Turrigiano E, Goldman B, *et al.* Characteristics of an outpatient treatment sample by primary substance of abuse. *J Addict Med* 2013;**7**:363–71	No relevant outcomes
Carroll KM, Easton CJ, Nich C, Hunkele KA, Neavins TM, Sinha R, *et al.* The use of contingency management and motivational/skills-building therapy to treat young adults with marijuana dependence. *J Consult Clin Psychol* 2006;**74**:955–66	Not relevant population
Carroll KM, Ball SA, Martino S, Nich C, Babuscio TA, Nuro KF, *et al.* Computer-assisted delivery of cognitive–behavioral therapy for addiction: A randomized trial of CBT4CBT. *Am J Psychiatry* 2008;**165**:881–8	No relevant outcomes
Carroll KM, Nich C, Lapaglia DM, Peters EN, Easton CJ, Petry NM, *et al.* Combining cognitive behavioral therapy and contingency management to enhance their effects in treating cannabis dependence: less can be more, more or less. *Addiction* 2012;**107**:1650–9	Not relevant population
ClinicalTrials.gov. *Effectiveness of a Brief Intervention for Substances Consumption Linked to the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): A Randomized Control Trial in Chilean Primary Care*. 2013. URL: http://ClinicalTrials.gov/show/NCT01573416 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *Study Comparing Two Types of Psychotherapy for Treating Depression and Substance Abuse*. 2009. URL: http://ClinicalTrials.gov/show/NCT00108407 (accessed 6 February 2014)	Not relevant intervention

Author and year	Reason for exclusion
ClinicalTrials.gov. *Integrated CBT for Cannabis Dependence With Co-occurring Anxiety Disorders*. 2013. URL: https://clinicaltrials.gov/show/NCT01875796 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *Maximizing the Efficacy of Cognitive Behavior Therapy and Contingency Management*. 2011. URL: https://clinicaltrials.gov/ct2/show/NCT00350649 (accessed 6 February 2014)	Not relevant population
ClinicalTrials.gov. *Effect of Motivational Therapy on Schizophrenia With Cannabis Misuse*. 2013. URL: https://clinicaltrials.gov/show/NCT00798109 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *Adapted Cognitive/Affective Remediation for Cannabis Misuse in Schizophrenia*. 2011. URL: https://clinicaltrials.gov/show/NCT01292577 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *Screening, Brief Intervention and Referral to Treatment for Substance Abuse in Mental Health Treatment Settings*. 2013. URL: https://clinicaltrials.gov/show/NCT01883791 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *CANDIS – Targeted Treatment for Cannabis Disorders*. 2007. URL: http://ClinicalTrials.gov/show/NCT00252980 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *CANDIS-II: Evaluation of the Cognitive-behavioural Treatment Programme CANDIS*. 2009. URL: http://ClinicalTrials.gov/show/NCT00673647 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *Marijuana Treatment Project – 3*. 2014. URL: http://ClinicalTrials.gov/show/NCT00107588 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *Specialized Addiction Treatment Versus Treatment as Usual for Young Patients With Cannabis Abuse and Psychosis*. 2011. URL: https://clinicaltrials.gov/ct2/show/NCT00484302 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *INCA – Intervention and Neuropsychology in Cannabis Abuse*. 2007. URL: https://clinicaltrials.gov/ct2/show/NCT00279604 (accessed 6 February 2014)	No relevant outcomes
ClinicalTrials.gov. *A Brief Marijuana Intervention for Adolescent Women – 1*. 2013. URL: https://clinicaltrials.gov/ct2/show/NCT00227864 (accessed 6 February 2014)	No relevant outcomes
Copeland J, Swift W, Rees V, Copeland J, Swift W, Rees V. Clinical profile of participants in a brief intervention program for cannabis use disorder. *J Subst Abuse Treat* 2001;**20**:45–52	No relevant outcomes
Diamond GS, Liddle HA, Wintersteen MB, Dennis ML, Godley SH, Tims F, *et al.* Early therapeutic alliance as a predictor of treatment outcome for adolescent cannabis users in outpatient treatment. *Am J Addict* 2006;**15**(Suppl. 1):26–33	Not relevant population
Drapkin ML. Tate SR, McQuaid JR, Brown SA. Does initial treatment focus influence outcomes for depressed substance abusers? *J Subst Abuse Treat* 2008;**35**:343–50	No relevant outcomes
Favrod J. Motivational interventions: psychosis and cannabis. *Encephale* 2009;**35**:S209–13	Not in English
Fohlmann AH, Hjorthoej C, Larsen A, Nordentoft M. CapOpus. Randomized clinical trial: specialized addiction treatment (MI & CBT) versus treatment as usual for young patients with cannabis abuse and psychosis. *Early Interv Psychiatry* 2010;**4**:160	No relevant outcomes
Gaudiano BA, Weinstock LM, Miller IW. Improving treatment adherence in patients with bipolar disorder and substance abuse: rationale and initial development of a novel psychosocial approach. *J Psychiatr Pract* 2011;**17**:5–20	Not a RCT
Godley MD, Godley SH, Dennis ML, Funk RR, Passetti LL, Petry NM, *et al.* A randomized trial of assertive continuing care and contingency management for adolescents with substance use disorders. *J Consult Clin Psychol* 2014;**82**:40–51	Not relevant population
Godley MD, Godley SH, Dennis ML, Funk R, Passetti LL, Godley MD, *et al.* Preliminary outcomes from the assertive continuing care experiment for adolescents discharged from residential treatment. *J Subst Abuse Treat* 2002;**23**:21–32	Not relevant population
Goti J, Diaz R, Serrano L, Gonzalez L, Calvo R, Gual A, *et al.* Brief intervention in substance-use among adolescent psychiatric patients: a randomized controlled trial. *Eur Child Adoles Psychiatry* 2010;**19**:503–11	Not relevant population
Granholm E, Tate SR, Link PC, Lydecker KP, Cummins KM, McQuaid J, *et al.* Neuropsychological functioning and outcomes of treatment for co-occurring depression and substance use disorders. *Am J Drug Alcohol Abuse* 2011;**37**:240–9	No relevant outcomes

Author and year	Reason for exclusion
Greenfield SF, Trucco EM, McHugh RK, Lincoln M, Gallop RJ, Greenfield SF, *et al.* The Women's Recovery Group Study: a Stage I trial of women-focused group therapy for substance use disorders versus mixed-gender group drug counseling. *Drug Alcohol Depend* 2007;**90**:39–47	No relevant outcomes
Hawkins JD, Catalano RF Jr, Gillmore MR, Wells EA, Hawkins JD, Catalano RFJ, *et al.* Skills training for drug abusers: generalization, maintenance, and effects on drug use. *J Consult Clin Psychol* 1989;**57**:559–63	Not relevant population
Hendricks PS, Delucchi KL, Humfleet GL, Hall SM, Hendricks PS, Delucchi KL, *et al.* Alcohol and marijuana use in the context of tobacco dependence treatment: impact on outcome and mediation of effect. *Nicotine Tob Res* 2012;**14**:942–51	No relevant outcomes
Hendriks V, van der Schee E, Blanken P, Hendriks V, van der Schee E, Blanken P. Treatment of adolescents with a cannabis use disorder: main findings of a randomized controlled trial comparing multidimensional family therapy and cognitive behavioral therapy in The Netherlands. *Drug Alcohol Depend* 2011;**119**:64–71	Not relevant population
Hendriks VM, van der Schee E, Blanken P. Multidimensional family therapy and cognitive behavioral therapy in adolescents with a cannabis use disorder: a randomised controlled study. *Tijdschrift voor Psychiatrie* 2013; **55**:747–59	Not in English
Henggeler SW, Pickrel SG, Brondino MJ. Multisystemic treatment of substance-abusing and dependent delinquents: outcomes, treatment fidelity, and transportability. *Ment Health Serv Res* 1999;**1**:171–84	Not relevant population
Hides LM, Elkins KS, Scaffidi A, Cotton SM, Carroll S, Lubman DI, *et al.* Does the addition of integrated cognitive behaviour therapy and motivational interviewing improve the outcomes of standard care for young people with comorbid depression and substance misuse? *Med J Aust* 2011;**195**:S31–7	Not a RCT
Hides L, Carroll S, Scott R, Cotton S, Baker A, Lubman D, *et al.* Quik fix: a randomized controlled trial of an enhanced brief motivational interviewing intervention for alcohol/cannabis and psychological distress in young people. *Psychother Psychosom* 2013;**82**:122–4	No relevant outcomes
Hill KP, Toto LH, Lukas SE, Weiss RD, Trksak GH, Rodolico JM, *et al.* Cognitive behavioral therapy and the nicotine transdermal patch for dual nicotine and cannabis dependence: a pilot study. *Am J Addict* 2013;**22**:233–8	Not relevant intervention
Hjorthoj CR, Orlovska S, Fohlmann A, Nordentoft M. Psychiatric treatment following participation in the CapOpus randomized trial for patients with comorbid cannabis use disorder and psychosis. *Schizophr Res* 2013;**151**:191–6	No relevant outcomes
James W, Preston NJ, Koh G, Spencer C, Kisely SR, Castle DJ. A group intervention which assists patients with dual diagnosis reduce their drug use: a randomised controlled trial. *Psychol Med* 2004;**34**:983–90	No relevant outcomes
Jerrell JM, Ridgely MS. Comparative effectiveness of three approaches to serving people with severe mental illness and substance abuse disorders. *J Nerv Ment Dis* 1995;**183**:566–76	No relevant outcomes
Johnson IS, Craig T, Hinton T, King M, Major B, Marston L. Randomised controlled trial of the clinical and cost-effectiveness of a contingency management intervention for reduction of cannabis use and of relapse in early psychosis (Project record). *Health Technology Assessment Database* 2012. URL: www.nets.nihr.ac.uk/projects/hta/0914450 (accessed 6 February 2014)	No relevant outcomes
Jonas B, Tossmann P, Tensil M, Leuschner F, Struber E. Efficacy of a single-session online-intervention on problematic substance use. *Sucht* 2012;**58**:173–82	Not in English
Kadden RM, Litt MD, Dion KB. Increased alcohol use following treatment for marijuana dependence. *Alcohol Clin Exp Res* 2004;**28**:146A	No relevant outcomes
Kay-Lambkin FJ, Baker AL, Kelly BJ, Lewin TJ. It's worth a try: the treatment experiences of rural and Urban participants in a randomized controlled trial of computerized psychological treatment for comorbid depression and alcohol/other drug use. *J Dual Diagn* 2012;**8**:262–76	No relevant outcomes
Kemp R, Harris A, Vurel E, Sitharthan T. Stop Using Stuff: Trial of a drug and alcohol intervention for young people with comorbid mental illness and drug and alcohol problems. *Australas Psychiatry* 2007;**15**:490–3	No relevant outcomes

Author and year	Reason for exclusion
Killeen TK, Upadhyana H, Mcrae A, Waldrop A, Brown C, Brady K. Contingency management for community treatment-seeking adolescents with marijuana use disorders. *Proceedings of the 70th Annual Scientific Meeting of the College on Problems of Drug Dependence; 2008 June 14–19; San Juan, Puerto Rico, USA* 2008;95. URL: www.cpdd.vcu.edu/Pages/Meetings/CPDD08AbstractBook2.pdf (accessed 6 February 2014)	Not relevant population
Kleber HD, Weiss RD, Anton J, George TP, Greenfield SF, Kosten TR, *et al.* Treatment of patients with substance use disorders: Second edition. *Am J Psychiatry* 2006;**163**(Suppl. 8):1–81	No relevant outcomes
Kuper LE, Gallop R, Greenfield SF. Changes in coping moderate substance abuse outcomes differentially across behavioral treatment modality. *Am J Addict* 2010;**19**:543–9	No relevant outcomes
Latimer WW, Winters KC, D'Zurilla T, Nichols M. Integrated family and cognitive–behavioral therapy for adolescent substance abusers: a stage I efficacy study. *Drug Alcohol Depend* 2003;**71**:303–17	Not relevant population
Lawlor E, Madigan K, Russell V, O'Connor JJ, Turner N, Clarke M, *et al.* Engagement with a group-based psychological intervention for those with early phase psychosis and concurrent use of cannabis. *Early Interv Psychiatry* 2012;**6**:28	No relevant outcomes
Lehman AF, Herron JD, Schwartz RP, Myers CP. Rehabilitation for adults with severe mental illness and substance use disorders. A clinical trial. *J Nerv Ment Dis* 1993;**181**:86–90	No relevant outcomes
Liddle HA, Dakof GA, Parker K, Diamond GS, Barrett K, Tejeda M, *et al.* Multidimensional family therapy for adolescent drug abuse: results of a randomized clinical trial. *Am J Drug Alcohol Abuse* 2001;**27**:651–88	Not relevant population
Liddle HA, Dakof GA, Turner RM, Henderson CE, Greenbaum PE, Liddle HA, *et al.* Treating adolescent drug abuse: a randomized trial comparing multidimensional family therapy and cognitive behavior therapy. *Addiction* 2008;**103**:1660–70	Not relevant population
Lykke J, Oestrich I, Austin SF, Hesse M. The implementation and evaluation of cognitive milieu therapy for dual diagnosis inpatients: a pragmatic clinical trial. *J Dual Diagn* 2010;**6**:58–72	Not a RCT
Madigan K, Lawlor E, Brennan D, Turner N, Kinsella A, O'Connor JJ, *et al.* A multi-centre, randomised controlled trial of a group psychological intervention for psychosis with comorbid cannabis dependence over the early course of illness. *Early Interv Psychiatry* 2012;**6**:27	Study characteristics or secondary analysis
Magill M, Barnett NP, Apodaca TR, Rohsenow DJ, Monti PM. The role of marijuana use in brief motivational intervention with young adult drinkers treated in an emergency department. *J Stud Alcohol Drugs* 2009;**70**:409–13	Not relevant population
Mariani JJ, Cheng WY, Bisaga A, Sullivan M, Carpenter K, Nunes EV, *et al.* Comparison of clinical trial recruitment populations: treatment-seeking characteristics of opioid-, cocaine-, and cannabis-using participants. *J Subst Abuse Treat* 2011;**40**:426–30	No relevant outcomes
Marsden J, Farrell M, Bradbury C, Dale-Perera A, Eastwood B, Roxburgh M, *et al.* Development of the Treatment Outcomes Profile. *Addiction* 2008;**103**:1450–60	No relevant outcomes
Martin G, Copeland J. The adolescent cannabis check-up: randomized trial of a brief intervention for young cannabis users. *J Subst Abuse Treat* 2008;**34**:407–14	Not relevant population
Martino S, Carroll KM, Nich C, Rounsaville BJ. A randomized controlled pilot study of motivational interviewing for patients with psychotic and drug use disorders. *Addiction* 2006;**101**:1479–92	No relevant outcomes
McCambridge J, Strang J. The efficacy of single-session motivational interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: results from a multi-site cluster randomized trial. *Addiction* 2004;**99**:39–52	Not relevant population
McCambridge J, Strang J. Deterioration over time in effect of Motivational Interviewing in reducing drug consumption and related risk among young people. *Addiction* 2005;**100**:470–8	Not relevant population
McCambridge J, Slym RL, Strang J. Randomized controlled trial of motivational interviewing compared with drug information and advice for early intervention among young cannabis users. *Addiction* 2008;**103**:1809–18	Not relevant population
McCambridge J, Day M, Thomas BA, Strang J. Fidelity to Motivational Interviewing and subsequent cannabis cessation among adolescents. *Addict Behav* 2011;**36**:749–54	Not relevant population
McCambridge J, Hunt C, Jenkins RJ, Strang J. Cluster randomised trial of the effectiveness of motivational interviewing for universal prevention. *Drug Alcohol Depend* 2011;**114**:177–84	Not relevant population

Author and year	Reason for exclusion
McGillicuddy NB, Rychtarik RG, Duquette JA, Morsheimer ET. Development of a skill training program for parents of substance-abusing adolescents. *J Subst Abuse Treat* 2001;**20**:59–68	Not relevant population
McLellan AT. A randomized controlled trial of brief cognitive-behavioral interventions for cannabis use disorder. *J Subst Abuse Treat* 2001;**21**:65–6	Not a RCT
Miller WR. It all depends. *Addiction* 2008;**103**:1819–20	Not a RCT
Miller WR, Yahne CE, Tonigan JS. Motivational interviewing in drug abuse services: a randomized trial. *J Consult Clin Psychol* 2003;**71**:754–63	No relevant outcomes
Montgomery L, Petry NM, Carroll KM. Moderating effects of race in clinical trial participation and outcomes among marijuana-dependent young adults. *Drug Alcohol Depend* 2012;**126**:333–9	No relevant outcomes
Moore BA, Budney AJ. Abstinence at intake for marijuana dependence treatment predicts response. *Drug Alcohol Depend* 2002;**67**:249–57	No relevant outcomes
Morley KC, Sitharthan G, Haber PS, Tucker P, Sitharthan T. The efficacy of an opportunistic cognitive behavioral intervention package (OCB) on substance use and comorbid suicide risk: a multisite randomized controlled trial. *J Consult Clin Psychol* 2014;**82**:130–40	No relevant outcomes
Murphy DA, Chen X, Naar-King S, Parsons JT, Adolescent TN. Alcohol and marijuana use outcomes in the Healthy Choices motivational interviewing intervention for HIV-positive youth. *AIDS Patient Care Stds* 2012;**26**:95–100	Not relevant population
Nagel T, Robinson G, Condon J, Trauer T. Approach to treatment of mental illness and substance dependence in remote Indigenous communities: results of a mixed methods study. *Aust J Rural Health* 2009;**17**:174–82	Not relevant population
Nery FG, Soares JC. Comorbid bipolar disorder and substance abuse: Evidence-based options. *Current Psychiatry* 2011;**10**:57–66	Not a RCT
Nordentoft M, Hjorthoj C, Fohlmann A. Capopus trial: an observer-blinded RCT of specialized addiction treatment versus standard treatment for young patients with cannabis abuse and psychosis. *Eur Psychiatry* 2009;**24**:S1178	No relevant outcomes
Nyamathi A, Branson C, Kennedy B, Salem B, Khalilifard F, Marfisee M, *et al.* Impact of nursing intervention on decreasing substances among homeless youth. *Am J Addict* 2012;**21**:558–65	Not relevant intervention
Ondersma SJ, Svikis DS, Schuster CR. Computer-based brief intervention a randomised trial with postpartum women. *Am J Prev Med* 2007;**32**:231–8. [Erratum published in *Am J Prev Med* 2007;**32**:549]	Not relevant population
Peters EN, Nich C, Carroll KM. Primary outcomes in two randomized controlled trials of treatments for cannabis use disorders. *Drug Alcohol Depend* 2011;**118**:408–16	No relevant outcomes
Peters EN, Petry NM, Lapaglia DM, Reynolds B, Carroll KM. Delay discounting in adults receiving treatment for marijuana dependence. *Exp Clin Psychopharmacol* 2013;**21**:46–54	No relevant outcomes
Peterson PL, Baer JS, Wells EA, Ginzler JA, Garrett SB. Short-term effects of a brief motivational intervention to reduce alcohol and drug risk among homeless adolescents. *Psychol Addict Behav* 2006;**20**:254–64	Not relevant population
Phan O, Jouanne C, Monge S. A random clinical trial concerning the psychotherapy of adolescents addicted to cannabis. *Ann Med Psychol (Paris)* 2010;**168**:145–51	No relevant outcomes
Pokhrel P, Sussman S, Rohrbach LA, Sun P. Prospective associations of social self-control with drug use among youth from regular and alternative high schools. *Subst Abuse Treat Prev Policy* 2007;**2**:22	Not a RCT
Ramchand R, Griffin BA, Suttorp M, Harris KM, Morral A. Using a cross-study design to assess the efficacy of motivational enhancement therapy-cognitive behavioral therapy 5 (MET/CBT5) in treating adolescents with cannabis-related disorders. *J Stud Alcohol Drugs* 2011;**72**:380–9	Not relevant population
Rees V, Copeland J, Swift W, Roffman R, Stephens R. Brief cognitive behavioral interventions for cannabis dependence. *NIDA Research Monograph* 1999;**179**:79	No relevant outcomes
Riley KJ, Rieckmann T, McCarty D. Implementation of MET/CBT 5 for adolescents. *J Behav Health Serv Res* 2008;**35**:304–14	Not a RCT
Roffman RA, Stephens RS, Simpson EE, Whitaker DL. Treatment of marijuana dependence: preliminary results. *J Psychoactive Drugs* 1988;**20**:129–37	No relevant outcomes

Author and year	Reason for exclusion
Roffman RA, Klepsch R, Wertz JS, Simpson EE, Stephens RS. Predictors of attrition from an outpatient marijuana-dependence counseling program. *Addict Behav* 1993;**18**:553–66	No relevant outcomes
Rooke SE, Gates PJ, Norberg MM, Copeland J. Applying technology to the treatment of cannabis use disorder: Comparing telephone versus Internet delivery using data from two completed trials. *J Subst Abuse Treat* 2014;**46**:78–84	No relevant outcomes
Rowe C, Rigter H, Henderson C, Gantner A, Mos K, Nielsen P, *et al.* Implementation fidelity of Multidimensional Family Therapy in an international trial. *J Subst Abuse Treat* 2013;**44**:391–99	Not relevant population
Ruehlmann A, Hoch E, Noack R, Henker J, Pixa A, Rohrbacher H, *et al.* Efficacy of the Manualized Cognitive-Behavioral Treatment Program Cannabis Use Disorders. Reno/Sparks, Nevada, NV: Proceedings of the 71th Annual Scientific Meeting of the College on Problems of Drug Dependence; 2009. URL: www.cpdd.org/Pages/Meetings/CPDD09AbstractBook.pdf (accessed 6 February 2014)	Study characteristics or secondary analysis
Santisteban DA, Coatsworth JD, Perez-Vidal A, Kurtines WM, Schwartz SJ, LaPerriere A, *et al.* Efficacy of brief strategic family therapy in modifying Hispanic adolescent behavior problems and substance use. *J Fam Psychol* 2003;**17**:121–33	Not relevant population
Santisteban DA, Mena MP, McCabe BE. Preliminary results for an adaptive family treatment for drug abuse in Hispanic youth. *J Fam Psychol* 2011;**25**:610–14	Not relevant population
Shane P, Diamond GS, Mensinger JL, Shera D, Wintersteen MB. Impact of victimization on substance abuse treatment outcomes for adolescents in outpatient and residential substance abuse treatment. *Am J Addict* 2006;**15**(Suppl. 1):34–42	Not relevant population
Smeerdijk M, Keet R, Dekker N, van RB, Krikke M, Koeter M, *et al.* Motivational interviewing and interaction skills training for parents to change cannabis use in young adults with recent-onset schizophrenia: a randomized controlled trial. *Psychol Med* 2012;**42**:1627–36	Not relevant population
Smeerdijk M, Keet R, de HL, Barrowclough C, Linszen D, Schippers G. Feasibility of teaching motivational interviewing to parents of young adults with recent-onset schizophrenia and co-occurring cannabis use. *J Subst Abuse Treat* 2014;**46**:340–5	Not relevant population
Spring B, Ferguson MJ. CALM technology-supported intervention: synopsis of evidence for an emerging class of practice tool. *Transl Behav Med* 2011;**1**:8–9	Not relevant population
Stephens RS, Wertz JS, Roffman RA. Self-efficacy and marijuana cessation: a construct validity analysis. *J Consult Clin Psychol* 1995;**63**:1022–31	No relevant outcomes
Stephens RS, Wertz JS, Roffman RA. Predictors of marijuana treatment outcomes: the role of self-efficacy. *J Subst Abuse* 1993;**5**:341–53	No relevant outcomes
Stephens RS, Babor TF, Kadden R, Miller M, Marijuana Treatment Project Research Group. The Marijuana Treatment Project: rationale, design and participant characteristics. *Addiction* 2002;**97**(Suppl. 1):109–24	No relevant outcomes
Strain EC. Single versus multiple drug focus in substance abuse clinical trials research: The devil is in the details. *Drug Alcohol Depend* 2003;**70**:131–4	No relevant outcomes
Strang J, McCambridge J. Can the practitioner correctly predict outcome in motivational interviewing? *J Subst Abuse Treat* 2004;**27**:83–8	No relevant outcomes
Stanger C, Budney AJ, Kamon JL. Contingency management for adolescent marijuana abuse. Proceedings of the 68th Annual Scientific Meeting of the College on Problems of Drug Dependence. Scottsdale, AZ; 2006	Not relevant population
Tetzlaff BT, Kahn JH, Godley SH, Godley MD, Diamond GS, Funk RR, *et al.* Working alliance, treatment satisfaction, and patterns of posttreatment use among adolescent substance users. *Psychol Addict Behav* 2005;**19**:199–207	Not relevant population
VanScoyoc J, Stanger C, Budney, Thostenson J. Disruptive behavior disorder influence response to contingency management among adolescent marijuana abusers. Proceedings of the 70th Annual Scientific Meeting of the College on Problems of Drug Dependence. San Juan, PR; 2008	Not relevant intervention
Vendetti J, McRee B, Miller M, Christiansen K, Herrell J, Marijuana Treatment Project Research Group. Correlates of pre-treatment drop-out among persons with marijuana dependence. *Addiction* 2002;**97**(Suppl. 1):125–34	No relevant outcomes
Waldron HB, Slesnick N, Brody JL, Turner CW, Peterson TR. Treatment outcomes for adolescent substance abuse at 4- and 7-month assessments. *J Consult Clin Psychol* 2001;**69**:802–13	Not relevant population

Author and year	Reason for exclusion
Waldron HB, Turner CW, Ozechowski TJ. Profiles of drug use behavior change for adolescents in treatment. *Addict Behav* 2005;**30**:1775–96	Not relevant population
Walker D, Stephens R, Rowland J, Roffman R. The influence of client behavior during motivational interviewing on marijuana treatment outcome. *Addict Behav* 2011;**36**:669–73	No relevant outcomes
Werch CE, Bian H, Carlson JM, Moore MJ, Diclemente CC, Huang IC, *et al.* Brief integrative multiple behavior intervention effects and mediators for adolescents. *J Behav Med* 2011;**34**:3–12	Not relevant population
White HR, Morgan TJ, Pugh LA, Celinska K, Labouvie EW, Pandina R, *et al.* Evaluating two brief substance-use interventions for mandated college students. *J Stud Alcohol* 2006;**67**:309–17	Not relevant population
Winstock AR, Ford C, Witton J. Assessment and management of cannabis use disorders in primary care. *BMJ* 2010;**30**:800–4	No relevant outcomes
Wittchen HU. Targeted cognitive–behavioral treatment for cannabis use disorders (CANDIS): efficacy, longterm stability, and efficiency. *Eur Neuropsychopharmacol* 2010;**20**:S206	Study characteristics or secondary analysis
Worley MJ, Tate SR, Brown SA. Mediational relations between 12-Step attendance, depression and substance use in patients with comorbid substance dependence and major depression. *Addiction* 2012;**107**:1974–83	Not relevant intervention
Wykes T. Cannabis use: Defining the targets for psychological treatment. *Schizophr Bull* 2011;**37**:285	No relevant outcomes

Appendix 4 Table of full data from included studies

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	4 months (post treatment)	***9 months***	***15 months***
Babor 2004[39] and Litt 2005[72]	1. Mean percentage of days smoking 2. Wait list = 75.59 (SD = 30.69), MET-2 = 55.86 (SD = 36.18), CBT/MET/CaseM-9 = 36.17 (SD = 38.83) 3. Reduction in days smoked is significant (*p* = value NR) 4. NR 1. Periods smoked per day (of 4) 2. Wait list = 1.95 (SD = 1.05), MET-2 = 1.35 (SD = 0.89), CBT/MET/CaseM-9 = 1.02 (SD = 1.07) 3. (Cohen's *d* statistic) MET-2 vs. wait list = 0.6, CBT/MET/CaseM-9 vs. wait list = 0.91, CBT/MET/CaseM-9 vs. MET-2 = 0.4; all between-group differences significant 4. NR 1. Mean joints per day 2. Wait list = 2.03 (SD = 1.94), MET-2 = 1.50 (SD = 1.62), CBT/MET/CaseM-9 = 1.00 (SD = 1.71) 3. (Cohen's *d* statistic) MET-2 vs. wait list = 0.29, CBT/MET/CaseM-9 vs. wait list = 0.43, both significant; CBT/MET/CaseM-9 vs. MET-2 = NS 4. NR 1. Reduction in days smoked (baseline to 4 month) 2. Wait list = 15.9%, MET-2 = 35.7%, CBT/MET/CaseM-9 = 58.8% 3. (Cohen's *d* statistic) MET-2 vs. wait list = 0.59, CBT/MET/CaseM-9 vs. wait list = 1.14, CBT/MET/CaseM-9 vs. MET-2 = 0.52; all between-group differences significant 4. NR 1. Abstinence over preceding 90 days 2. CBT/MET/CaseM-9 = 22.6%, MET-2 = 8.6%, wait list = 3.6% 3. $p < 0.001$ (between groups); CBT/MET/CaseM-9 vs. MET-2 or wait list = significant; MET-2 vs. wait list = NR 4. NR	1. Mean percentage of days smoking 2. MET-2 = 59.76 (SD = 36.78), CBT/MET/CaseM-9 = 43.87 (SD = 37.48) 3. (Cohen's *d* statistic) MET-2 CB VS MET-2 = 0.37, significant 4. NR 1. Periods smoked per day (of 4) 2. MET-2 = 1.39 (SD = 0.92), CBT/MET/CaseM-9 = 1.19 (SD = 1.02) 3. Treatment × time interaction 4. NR 1. Mean joints per day 2. MET-2 = 1.59 (SD = 2.28), CBT/MET/CaseM-9 = 1.48 (SD = 2.53) 3. NR 4. NR 5. 9 month 1. Abstinence over preceding 90 days 2. CBT/MET/CaseM-9 = 15.6%, MET-2 = 9.5% 3. $p > 0.05$ (between groups) (not significant) 4. NR	1. Mean percentage of days smoking 2. CBT/MET/CaseM-9 = 44.86 (SD = 40.52), MET-2 = 53.65 (SD = 38.57) 3. (Cohen's *d* statistic) 0.22, significant 4. NR 1. Reduction in days smoked (baseline to 15 month) 2. CBT/MET/CaseM-9 = 48%, MET-2 = 33% 3. NR 4. NR 1. Abstinence over preceding 90 days 2. CBT/MET/CaseM-9 = 22.7%, MET-2 = 12.5% 3. $p < 0.001$ (between groups, CBT/MET/CaseM-9 vs. MET-2) 4. NR

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	15 weeks (post treatment)		***12 months***
Baker 2006[52]	1. Days used during prior month via OTI (change, baseline to 15 weeks) 2. CBT/MI-10 + TAU mean change = –3.09 (SD NR; *n* analysed = 39); TAU mean change = + 0.86 (SD NR; *n* analysed = 34) 3. *p* = 0.02 (between groups for change) 4. NR 1. % with at least weekly use via OTI 2. CBT/MI-10 + TAU 64.1% (25/39); TAU 73.5% (25/34) 3. *p* = NS (between groups) 4. NR 1. % abstinence 2. CBT/MI-10 + TAU 23.1% (9/39); TAU 23.5% (8/34) 3. *p* = NS (between groups) 4. NR		1. Days used during prior month via OTI (change, baseline to 12 months) 2. CBT/MI-10 + TAU mean change = + 0.35 (SD NR; *n* analysed = 29); TAU mean change = –0.68 (SD NR; *n* analysed = 29) 3. *p* = NS 4. NR 1. % with at least weekly use via OTI 2. CBT/MI-10 + TAU 58.6% (17/29); TAU 55.2% (16/29) 3. *p* = NS (between groups) 4. NR 1. % abstinence 2. CBT/MI-10 + TAU 37.9% (11/29); TAU 34.5% (10/29) 3. *p* = NS (between groups) 4. NR
	3 months	***6 months (post treatment)***	***12 months***
Bonsack 2011[66]	1. Cannabis use: reduction in number of joints per week 2. CBT/MI-6 + TAU median = 6, range = 62. TAU median = 0.5 3. *p* = 0.015 4. NR 1. Number days abstinent last month 2. Median values – CBT/MI-6 + TAU = 5.0 (range 28), TAU = 8.5 (range 28) 3. *p* = 0.48 4. NR 1. Number days of binge use 2. Median values – CBT/MI-6 + TAU = 1.0 (range = 7), TAU = 1.0 (range = 12) 3. *p* = 0.94 4. NR	1. Cannabis use: reduction in number of joints per week 2. CBT/MI-6 + TAU median = 10.5, TAU median 0.5 3. *p* = 0.015 4. Overall median decrease five joints/ week 1. Number days abstinent last month 2. Median values – CBT/ MI-6 + TAU = 7.0 (range 28), TAU = 4.5 (range 28) 3. *p* = 0.83 4. NR 1. Number days of binge use 2. Median values – CBT/ MI-6 + TAU = 0.0 (range = 8), TAU = 0.0 (range = 4) 3. *p* = 0.48 4. NR	1. Cannabis use: reduction in number of joints per week 2. CBT/MI-6 + TAU median = 10, TAU median = 3.5 3. NS 4. NR 1. Number days abstinent last month 2. Median values –CBT/MI-6 + TAU = 5.5 (range 28), TAU = 8.5 (range 28) 3. *p* = 0.76 4. NR 1. Number days of binge use 2. Median values – CBT/MI-6 + TAU = 0 (range = 28), TAU = 0 (range = 20) 3. *p* = 0.97 4. NR

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	14 weeks	
Budney 2000[40]	1. Continuous cannabis abstinence (composite measure across all durations 1–14 weeks) 2. Absolute values NR, effect size w = 0.37 3. $p < 0.02$ (CBT/MET-14/vouchers vs. CBT/MET-14 and MET-4), p = NS (CBT/MET-14 vs. MET-4) 4. NR	1. Abstinence for at least 7 weeks 2. CBT/MET-14/vouchers = 40%, CBT/MET-14 = 5%, MET-4 = 5% 3. NS 4. NR
	1. Mean duration continuous abstinence 2. CBT/MET-14CBT/MET-14/vouchers = 4.8 weeks (SD = 4.9), CBT/MET-14 = 2.3 weeks (SD = 3.0), MET-4 = 1.6 weeks (SD = 2.4) 3. $p < 0.05$ (CBT/MET-14/vouchers vs. CBT/MET-14 and MET-4), other comparisons NS 4. NR	1. Self-reported days of cannabis use prior 30 days (least square means) 2. CBT/MET-14/vouchers = 6.6 (SE = 2.6), CBT/MET-14 = 7.4 (SE = 2.3), MET-4 = 13.0 (SE = 2.1) 3. NS ($p = 0.12$ for CBT/MET-14/vouchers and CBT/MET-14 vs. MET-4) 4. NR
	1. End-of-treatment abstinence (past 30 days) 2. CBT/MET-14/vouchers = 35%, CBT/MET-14 = 10%, MET-4 = 5% 3. $p < 0.05$ (CBT/MET-14/vouchers vs. CBT/MET-14 and M-4) 4. NR	1. Abstinence for at least 4 weeks 2. CBT/MET-14/vouchers = 50%, CBT/MET-14 = 30%, MET-4 = 10% 3. $p < 0.05$ (CBT/MET-14/vouchers vs. CBT/MET-14 and MET-4) 4. NR
	1. Percentage of cannabis negative urine samples 2. CBT/MET-14/vouchers = 43%, CBT/MET-14 = 31%, MET-4 = 19% 3. $p = 0.09$ (NS) 4. NR	
	14 weeks (post treatment)	***12 months***
Budney 2006[41]	1. Days used during prior month 2. CBT-14/vouchers mean = 9.7 (SD = 9.1); CBT-14 mean = 8.6 (SD = 9.2); voucher mean = 11.3 (SD = 9.7) 3. $p = 0.71$ (between groups); $p < 0.01$ (for all groups from baseline) 4. NR	1. Days used during prior month 2. CBT-14/vouchers mean = 12.5 (SD = 13.9); CBT-14 mean = 18.3 (SD = 15.7); voucher mean = 18.1 (SD = 13.6) 3. For repeated measures up to 12 months: $p = 0.15$ (between groups); $p < 0.01$ (all groups over time post treatment; days of use increased after treatment ended) 4. NR
	1. Number of times used per day on days when used 2. CBT-14/vouchers mean = 2.7 (SD = 3.0); CBT-14 mean = 1.6 (SD = 1.6); voucher mean = 2.6 (SD = 2.5) 3. $p < 0.05$ (voucher vs. CBT-14); $p < 0.01$ (for all groups from baseline) 4. NR	1. Number of times used per day on days when used 2. NR 3. For repeated measures up to 12 months: $p = 0.31$ (between groups); $p = 0.94$ (all groups over time post treatment; no change after treatment ended) 4. NR
	1. Weeks of continuous abstinence 2. CBT-14/vouchers mean = 5.3 (SD = 4.7); CBT-14 mean = 3.5 (SD = 3.2); Voucher mean = 6.9 (SD = 5.4) 3. $p = 0.02$ (voucher vs. CBT-14); $p = 0.20$ (CBT-14CBT-14–14/vouchers vs. CBT-14); $p = 0.32$ (voucher vs. CBT-14/vouchers) 4. NR	
	1. Continuous abstinence for ≥ 6 weeks 2. CBT-14/vouchers 40%; CBT-14 17%; voucher 50% 3. $p < 0.05$ (voucher vs. CBT-14; CBT-14/vouchers vs. CBT-14) 4. voucher vs. CBT-14: odds ratio = 6.0 (95% CI 1.7 to 21.0); CBT-14/vouchers vs. CBT-14: odds ratio = 4.1 (95% CI 1.2 to 14.4) 5. 14 weeks	

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	1. % abstinence (point prevalence) 2. CBT-14/vouchers 43%; CBT-14 30%; voucher 40% 3. NR 4. NR	1. % abstinence (point prevalence) 2. CBT-14/vouchers 37%; CBT-14 23%; voucher 17% 3. $p < 0.05$ (CBT-14/vouchers vs. voucher) at 12 months. For repeated measures up to 12 months: $p = 0.04$ (CBT-14/vouchers vs. CBT-14); $p = 0.08$ (CBT-14/vouchers vs. voucher); $p = 0.74$ (CBT-14 vs. voucher); $p < 0.01$ (all groups over time post treatment; abstinence levels decreased after treatment ended) 4. For repeated measures up to 12 months: CBT-14/vouchers vs. CBT-14: odds ratio = 2.45 (95% CI 1.01 to 5.93); CBT-14/vouchers vs. voucher: odds ratio = 2.17 (95% CI 0.91 to 5.17)
	1. Abstinence for specific period of time, at least 2, 4, 6, and 8 weeks 2. NR 3. $p = 0.02$ (voucher vs. CBT-14, favours voucher), $p = 0.01$ (CBT14/vouchers vs. CBT-14), NS, value NR (CBT-14/vouchers vs. voucher) 4. NR	
	12 weeks (post treatment)	***9 months***
Budney 2011[42] (abstract) and ClinicalTrials.gov 2013[73]	1. Weeks of continuous abstinence 2. CBT/MET-9/voucher mean = 3.55 (SD = 4.39), computer-delivered CBT/MET-9 + brief therapist + voucher = 2.82 (SD = 4.21), MET-2 mean = 0.78 (SD = 1.97) 3. $p < 0.05$ (CBT/MET-9/voucher and computer-delivered CBT /MET-9 + brief therapist + voucher vs. MET-2); $p > 0.05$ (CBT/MET-9/voucher vs. computer-delivered CBT /MET-9 + brief therapist + voucher) 4. NR	1. % abstinence (point prevalence) 2. CBT/MET-9/voucher = 3/29 (10.3%), computer-delivered CBT/MET-9 + brief therapist + voucher = 7/30 (23.3%), MET-2 = 1/16 (6.3%) 3. Across all time points from end of treatment to 9 months post treatment: $p < 0.05$ (between groups) 4. NR
	1. % abstinence (point prevalence) 2. CBT/MET-9/voucher = 13/29 (44.8%), computer-delivered CBT/MET-9 + brief therapist + voucher = 14/30 (46.7%), MET-2 = 2/16 (12.5%) 3. NR 4. NR	
	34 weeks (median)	
Copeland 2001[53]	1. % days abstinent since last treatment session 2. CBT-6 mean = 35.9% (SD = 34.8), MI-1 mean = 44.8% (SD = 37.7), wait list mean = 29.7% (SD = 32.6) 3. $p = 0.09$ (between wait list and CBT-1), not significant (wait list vs. CBT-6 or MI-1 vs. CBT-6) 4. NR	
	1. Continuous abstinence since last treatment session 2. CBT-6: 15.1%, MI-1: 4.9%; wait list: 0%. (SD/SE NR) 3. NR 4. NR	
	1. Complete abstinence in prior month 2. CBT-6: 20.8%; 1 CBT: 17.2%; wait list: 3.6% (SDs NR) 3. $p = 0.05$ (CBT-6 + MI-1vs wait list), $p = 0.6$ (CBT-6 vs. MI-1) 4. NR	

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	1. Changes in average daily consumption via OTI (baseline to follow-up) 2. Final values: CBT-6 mean = 1.3 (SD = 0.9), MI-1 mean = 1.5 (SD = 1.2), wait list mean = 1.8 (SD = 1.0) change from baseline: CBT-6 = –0.8, MI-1 = –0.5, wait list = –0.4 (SDs NR) 3. Differences adjusted for baseline: $p = 0.02$ (between CBT-6 and wait list), $p = 0.2$ (between MI-1 and wait list), $p = 0.3$ (between MI-1 and CBT-6) 4. NR		
	1 month (post treatment)	***2 months***	***3 months***
de Dios 2012[43]	1. Frequency of cannabis use 2. NR 3. $p = 0.031$ (between group, favours MI/meditation-2 4. NR 1. Number of days of cannabis use over 30 days 2. NR 3. $p < 0.05$ 4. 6.15 fewer days for MI/meditation-2 than AO (95% CI = –11.00 to –1.09)	1. Number of days of cannabis use over 30 days 2. NR 3. $p < 0.05$ 4. 7.81 fewer days for MI/meditation-2 than AO (95% CI = –13.48 to –1.98)	1. Number of days of cannabis use over 30 days 2. NR 3. $p < 0.05$ 4. 6.83 fewer days for MI/meditation-2 than AO (95% CI = –12.94 to –0.81) 1. Full abstinence (all follow-up points) 2. NR 3. NS between groups 4. NR
	3 months (post treatment)	***6 months***	
Edwards 2006[54]	1. Number using cannabis in past 4 weeks 2. CBT/MI-10 + TAU = 13/23 (56.5%), psychoeducation (non-cannabis) –10 + TAU = 13/24 (54.2%) 3. $p = 0.87$ (between group, not adjusted for baseline measurement) 4. NR 1. % days using cannabis in past 4 weeks 2. CBT/MI-10 + TAU = 30.4 (SD = 41.8), psychoeducation (non-cannabis) –10 + TAU = 18.8 (SD = 30.6) 3. $p = 0.99$ (between groups); $p < 0.001$ (change from baseline in both groups) 4. NR 1. % days using cannabis in past 4 weeks for those using cannabis at least once per week 2. NR 3. $p = 0.53$ (between groups); $p = 0.002$ (change from baseline in both groups) 4. NR	1. Number using cannabis in past 4 weeks 2. CBT/MI-10 + TAU = 15 (65.2%), psychoeducation (non-cannabis) – 10 + TAU = 12 (50%) 3. $p = 0.29$ (between groups) 4. NR 1. % days using cannabis in past 4 weeks 2. CBT/MI-10 + TAU = 32.4 (SD = 44.9), psychoeducation (non-cannabis) –10 + TAU = 19.3 (SD = 30.4) 3. $p = 0.84$ 4. NR 1. % days using cannabis in past 4 weeks for those using cannabis at least once per week 2. NR 3. $p = 0.86$ (between groups) 4. NR	

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	6 months	
Fernandes 2010[62]	1. Reduction in cannabis use (% abstinent,% decreased use,% relapsed use) 2. Tele-brief MI-1: 73% abstinent, 16% decreased use, 2% relapsed use (*n* analysed = 262). Written cannabis information: 59% abstinent, 21% decreased use, 5% relapsed use (*n* analysed = 262) 3. For abstinence: $p < 0.05$ 4. For abstinence: OR = 1.6 (95% CI 1.2 to 2.0)	
	3 months (post treatment)	***12 months***
Fischer 2012[75] and Fischer 2013[64]	Note: cannabis BI group is combination of brief MI and written cannabis information groups. Control group is combination of therapist general health MI-1 and written general health information	
	1. Mean number of days used cannabis 2. Cannabis BI = 22.3 (95% CI 20.3 to 24.4) *n* = 62, control = 22.5 (95% CI 20.5, 24.6) *n* = 51. Separate oral and written groups: brief MI-1 = 18.78 (BL = 21.96) *n* = 23, written cannabis information = 24.38 (BL = 24.82) *n* = 39, therapist general health MI-1 = 21.18 (BL = 21.36) *n* = 22, written general health information = 23.55 (BL = 25.35) *n* = 29 3. NS (between groups), $p = 0.024$ (all groups baseline to 3 months) per group from baseline: brief MI-1: $p = 0.125$, written cannabis information: $p = 0.469$, therapist general health MI-1: $p = 0.737$, written general health information: $p = 0.108$ 4. NR	1. Mean number of days used cannabis 2. Cannabis BI = 22.3 (95% CI 19.8 to 24.8) *n* = 40, control = 22.1 (95% CI 18.9 to 25.3) *n* = 32 3. NS 4. NR
	1. Mean number cannabis use episodes/day previous 30 days 2. Cannabis BI = 2.4 (95% CI 1.8, 3.0) *n* = 40, control = 2.4 (95% CI 1.5 to 3.4) *n* = 32 3. NS 4. NR	1. Mean number cannabis use episodes/day previous 30 days 2. Cannabis BI = 2.6 (95% CI 1.6, 3.7) *n* = 40, control = 2.2 (95% CI 1.7, 2.6) *n* = 32 3. NS 4. NR
	4 weeks (post treatment)	***12 weeks***
Gates 2012[55]	Both groups showed significant improvements from baseline on all outcomes ($p < 0.001$) at 4 and 12 weeks	
	1. Days cannabis use (previous 28 days) 2. Tele-CBT/MI-4 = 8.5 (SD = 10.7), wait list = 13.4 (SD = 11.2) 3. *p* = NR 4. NR	1. Days cannabis use (previous 28 days) 2. Tele-CBT/MI-4 = 7.3 (SD = 10.3), wait list = 12.5 (SD = 11.4) 3. *p* = NR 4. NR
	1. % days abstinent (previous 28 days) 2. Tele-CBT/MI-4 = 69.5 (SD = 38.0), wait list = 51.9 (SD = 40.3) 3. $p = 0.054$ (all *p*-values based on treatment × time interactions) 4. NR	1. % days abstinent (previous 28 days) 2. Tele-CBT/MI-4 = 73.3 (SD = 36.8), wait list = 55.3 (SD = 40.7) 3. $p = 0.057$ 4. NR
	1. Cannabis use per typical day (cones/day) 2. Tele-CBT/MI-4 = 3.4 (SD = 8.0), wait list = 6.5 (SD = 9.5) 3. $p = 0.017$ 4. NR	1. Cannabis use per typical day (cones/day) 2. Tele-CBT/MI-4 = 5.0 (SD = 13.3), wait list = 6.7 (SD = 10.4) 3. $p = 0.340$ 4. NR

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	6 months	
Gmel 2013[67]	1. Mean number of days of cannabis use per month, consistent users (at least twice a week) 2. Brief MI-1 = 9.3 (BL = 8.5), AO = 12 (BL = 10.6). Change from baseline: brief MI-1 = + 0.8, AO = + 1.4 3. $p = 0.342$ (adjusted for baseline) 4. NR	1. Cannabis use (cannabis users) 2. Brief MI-1 = 97/288 (33.7%); AO = 148/384 (38.5%) 3. NR for cannabis users subgroup 4. NR
	1. Cannabis use (cannabis users) 2. Brief MI-1 + booster = 49/145 (33.8%); brief MI-1 no booster = 48/143 (33.6%) 3. NR for cannabis users subgroup 4. NR	1. Mean number of days of cannabis use per month, consistent users (at least twice a week) – brief MI-1 + booster vs. brief MI-1 no booster 2. Brief MI-1 + booster = 9.8 (BL = 8.5), brief MI-1 no booster = 8.7 (BL = 8.6). Change from baseline: brief MI-1 + booster = + 1.3, brief MI-1 no booster = + 0.1 3. $p = 0.508$ (adjusted for baseline) 4. NR
	4 months	
Grenyer 1997[56]	1. Number 'quitting' cannabis 2. SEDP-16 = 17/20, brief MI-1 = 3/20 3. NR 4. NR	1. Changes in cannabis use (not defined) 2. NR 3. $p < 0.05$, effect sizes: SEDP-16 = 0.74, brief MI-1 = 0.41 4. NR
	4 months	***6 months (post treatment)***
Hjorthoj 2013[68] Hjorthoj 2012[80]	1. Number of days cannabis use in past month 2. NR 3. $p = 0.75$ (for RR) 4. RR (CBT/MI-24 + TAU vs. TAU) = 0.80 (95% CI 0.21 to 3.10)	1. Number of days cannabis use in past month 2. NR 3. $p = 0.42$ (for RR) 4. RR (CBT/MI-24 + TAU vs. TAU) = 0.76 (95% CI 0.38 to 1.50)
	1. Number joints previous month 2) (Hjorthoj 2012[80]): CBT/MI-24 + TAU = 28.4 (95% CI 13.5 to 43 2. TAU = 41.6 (95% CI 25.2 to 58.0) 3. $p = 0.23$ (between groups) 4. Mean difference = 13.3 (95% CI –8.5 to 35.1) fewer for CBT/MI-24 + TAU vs. TAU	1. Number joints previous month 2. (Hjorthoj 2012[80]): CBT/MI-24 + TAU = 27.3 (95% CI 12.6 to 41.9), TAU = 48.2 (95% CI 31.8 to 64.6) 3. $p = 0.06$ (between groups) 4. Mean difference = 20.9 (95% CI –1.0, 42.9) fewer for CBT/MI-24 + TAU vs. TAU
	1. Abstinence over previous month 2. NR 3. $p = 0.61$ 4. OR = 1.31 (95% CI 0.47 to 3.64)	
	1. Abstinence over previous month (4 month) 2. NR 3. $p = 0.37$ 4. OR = 0.64 (95% CI 0.25 to 1.68)	

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	8–12 weeks (post treatment)	***3 months***	***6 months***
Hoch 2012[59] and Hoch 2008[76]	1. Mean cannabis use, past 7 days (number of joints, bongs, pipes, etc.) 2. CBT/MET/PPS-10 = 8.1 (SD = 18.1), wait list = 24.9 (SD = 33.4) 3. CBT/MET/PPS-10 BL vs. post treatment: $p = 0.001$, effect size = –0.43. Wait list BL vs. post treatment: $p = 0.516$, effect size = 0.11 4. NR 1. Abstinence past 7 days, urine screening 2. CBT/MET/PPS-10 = 37/90 (41.1%), wait list = 4/32 (12.5%) 3. NR 4. NR 1. Abstinence CBT/MET/PPS-10 end of treatment 2. CBT/MET/PPS-10: ITT analysis: 49%. Completer analysis: 55%, wait list: 13% 3. NR 4. NR	1. Cannabis use per week 2. CBT/MET/PPS-10: BL = 27.1%, post treatment = 7.4%, follow-up = 14.1%, wait list 'did not improve' 3. $p < 0.0001$ (BL to follow-up) 4. NR	1. Mean cannabis use, past 7 days (number of joints, bongs, pipes, etc.) 2. CBT/MET/PPS-10 = 12.1 (SD = 19.1) 3. BL vs. 6 months: $p = 0.015$, ES = –0.29 4. NR 1. Abstinence past 7 days, urine screening (3 and 6 months) 2. CBT/MET/PPS-10 = 44.4% (3 months), 41.1% (6 months). Wait list no follow-up data 3. NR 4. NR
	12 weeks (post treatment)	***6 months***	
Hoch 2014[60]	1. Change abstinence rates (% negative urine drug screenings) (baseline to post assessment) 2. CBT/MET/PPS-10 = 34.6 increase (BL 11.7, post assessment 46.3), $n = 166$, wait list = 8.4% increase (BL 9.3, post ass 17.7), $n = 106$ 3. $p < 0.001$ 4. NR 1. Mean number cu units per week (total number of joints, bongs, pipes, etc.) 2. CBT/MET/PPS-10 = 5.2 (SD = 13.0), $n = 166$, wait list = 20.6 (SD = 30.0), $n = 106$ 3. $p < 0.001$ (between group) 4. $d = –0.9$ (95% CI –2.2 to 4.8) (between groups)	1. Change abstinence rates (% negative urine drug screenings) 2. CBT/MET/PPS-10 = 24.0 increase (BL 11.7, 6 months 35.7), $n = 53$ 3. NR 4. NR 1. Mean number cu units per week (total number of joints, bongs, pipes, etc.) (6-month assessment) 2. CBT/MET/PPS-10 = 20.8 (SD = 26.7) (BL), wait list = 5.3 (SD = 11.5) (6-month assessment) 3. $p = 0.002$ (from baseline) 4. $d = 0.7$ [(95% CI –2.6 to 4.4) (from baseline)	
	3 months		
Humeniuk 2012[71]	1. Pooled mean cannabis specific involvement scores via assist (higher = worse) 2. Follow-up: brief MI-1 = 14.4 (SD = 8.9), DTC = 15.4 (SD = 7.9). BL: brief MI-1 = 17.5 (SD = 7.1), DTC = 17.1 (6.8) 3. Brief MI-1 significantly lower (*p*-value NR). Significant improvement over time across groups ($p < 0.001$) 4. NR		

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	4 months	
Jungerman 2007[63]	1. Mean % days smoked (past 90 days) 2. Wait list = 86.12 (SE = 4.38), CBT/MI/RP-4 (1 month) = 64.90 (SE = 4.27), CBT/MI/RP-4 (3 months) = 56.21 (SE = 4.38) 3. $p < 0.0001$ (between all groups) 4. NR 1. Change in mean % days smoked (past 90 days) (baseline to 4 months) 2. Wait list = 7.94 (SE = 4.51), CBT/MI/RP-4 (1 month) = 29.29 (SE = 4.34), CBT/MI/RP-4 (3 months) = 31.95 (SE = 4.51) 3. $p = 0.0003$ (between all groups), $p = 0.0008$ (CBT/MI/RP-4 (1 month) vs. wait list), $p = 0.0002$ [CBT/MI/RP-4 (3 months) vs. wait list], $p = 0.6708$ [CBT/MI/RP-4 (1 month) vs. 3 MIRP] 4. NR 1. Mean periods smoked (of 4 periods) 2. Wait list = 1.93 (SD = 0.13), CBT/MI/RP-4 (1 month) = 1.19 (SE = 0.13), CBT/MI/RP-4 (3 months) = 1.38 (SD = 0.13) 3. $p = 0.0004$ (between all groups) 4. NR	1. Mean joints per day 2. Wait list = 1.56 (SD = 0.18), CBT/MI/RP-4 (1 month) = 0.78 (SE = 0.17), CBT/MI/RP-4 (3 months) = 0.77 (SD = 0.18) 3. $p = 0.0015$ (between all groups) 4. NR 1. Change in mean joints per day (baseline to 4 months) 2. Wait list = 0.28 (SD = 0.26), CBT/MI/RP-4 (1 month) = 1.28 (SE = 0.25), CBT/MI/RP-4 (3 months) = 1.31 (SD = 0.26) 3. $p = 0.0060$ (between all groups), $p = 0.9366$ (CBT/MI/RP-4 (3 months) vs. 1 MIRP), $p = 0.0051$ [wait list vs. CBT/MI/RP-4 (3 months)], $p = 0.0056$ [wait list vs. CBT/MI/RP-4 (1 month)] 4. NR 1. Abstinence rates 2. MI/RP-4 (3 months) = 3 (6.5%), MI/RP-4 (1 month) = 1 (1.9%), wait list = 1 (3.7%) 3. $p = 0.5268$ 4. NR 1. Urine analysis, % of positive results 2. MI/RP-4 (1 month) = 90%, MI/RP-4 (3 months) = 81.8%, wait list = 100% 3. NR 4. NR 1. Change in mean periods smoked (baseline to 4 months) 2. Wait list = 0.14 (SD = 0.13), CBT/MI/RP-4 (1 month) = 0.86 (SE = 0.12), CBT/MI/RP-4 (3 months) = 0.67 (SD = 0.13) 3. $p = 0.0030$ (between all groups), $p = 0.3007$ (CBT/MI/RP-4 (3 months) vs. 1 MIRP), $p = 0.0037$ (wait list vs. 3 MIRP), $p < 0.0001$ [wait list vs. CBT/MI/RP-4 (1 month)] 4. NR
	30 days (first episode of treatment after 30 days)	***14 months***
Kadden 2007[44] Litt 2008[77]	1. Time to first cannabis use 2. 50% smoked cannabis immediately after baseline session; 18% not relapsed over 14-month follow-up 3. No significant difference between groups when excluding first 30 days: no significant difference between groups except vouchers vs. CaseM-9 – $p < 0.05$ (favours vouchers) 4. 0.33 to 0.95	1. Proportion of days abstinent 2. All groups increased days abstinent from baseline at post treatment (2 months) and up to 14 months ($p < 0.001$). Voucher subjects reported more days abstinent than CaseM-9 at post treatment (2 months, $p < 0.05$) but not at later time points (values NR). No other significant differences between treatment groups. (Litt 2008[77] reports values at all time points, 14 month extracted: CaseM-9 = 19.2, MET/CBT = 20.4, vouchers = 12.5, CBT/MET-9/vouchers = 27.6) 3. [See above in point 2] 4. NR 1. Joints smoked per smoking day 2. Across all groups, decrease from 5 at baseline to 2.4 at post treatment (2 months), 1.7 at 5 months, 0.5 at 14 months ($p < 0.001$) no significant difference between treatment groups 3. [See above in point 2] 4. NR

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
		1. Continuous abstinence 2. Longest period of abstinence at any point: CBT/MET-9/vouchers > vouchers > CBT/MET-9 > CaseM-9 (values NR) ($p < 0.05$). CBT/MET-9/vouchers or vouchers > CBT/MET-9 or CaseM-9 ($p < 0.05$) at each time point: CBT/MET-9/vouchers and CBT/MET-9 levels of abstinence remained relatively constant at all time points (27% and 19% at 14 months) while vouchers levels were high post treatment (2–5 months) but declined after this 3. [See above in point 2] 4. NR
	3 months (post treatment)	***12 months***
Kay-Lambkin 2009[57]	1. Mean cannabis use per day over previous 30 days via OTI 2. Brief MI-1 = 7.24 (SD = 7.77), CBT/MI-10 = 8.9 (SD = 11.25), computer-delivered CBT/MI + brief therapist-10 = 5.77 (SD = 6.56) 3. NR 4. NR	1. Mean cannabis use per day over previous 30 days via OTI 2. Brief MI-1 = 8.61 (SD = 10.16), CBT/MI-10 = 5.72 (SD = 6.22), computer-delivered CBT/MI + brief therapist-10 = 3.34 (SD = 5.52) 3. $p < 0.01$ (intervention groups vs. brief MI-1 over time) 4. NR 1. Change in mean cannabis use per day over previous 30 days (ITT analysis) 2. Brief MI-1 = 0.76, CBT/MI-10 = 6.22, computer-delivered CBT/MI + brief therapist-10 = 12.15, CBT/MI-10 + computer-delivered CBT/MI + brief therapist-10 = 9.31 3. NR 4. NR 1. Percentage with ≥ 50% reduction in cannabis use (ITT analysis) 2. Brief MI-1 = 34.8%, CBT/MI-10 = 61.5%, computer-delivered CBT/MI + brief therapist-10 = 78.9%, CBT/MI-10 + computer-delivered CBT/MI + brief therapist-10 = 71.9% 3. NS 4. Odds ratios: T vs. brief MI-1: OR = 1.56 (95% CI 0.32 to 7.57); C vs. brief MI-1: OR = 4.55 (95% CI 0.91 to 22.91); T + C vs. brief MI-1: OR = 2.66 (95% CI 0.68, 10.45)
	3 months	
Kay-Lambkin 2011[58]	1. Cannabis abstinence (cannabis users only) 2. CBT/MI-10 = 4 (NR%), PCT = 7 (21%), CAC = 4 (10%), therapist-delivered treatment (CBT/MI and PCT) = 11 (16%), CBT/MI and CAC = 8 (11%) 3. CBT/MI + CAC vs. PCT: $p = 0.164$, CAC vs. therapist delivered treatment: $p = 0.309$ 4. NR 1. Change in OTI Q score (cannabis users only) 2. CBT/MI + CAC = 3-point reduction, PCT = 0.15 point increase, CAC = 2.7 point reduction, therapist-delivered treatment = 1.1 point reduction 3. Therapist-delivered treatment vs. CAC therapy: $p = 0.347$, CBT/MI + CAC vs. PCT: $p = 0.140$ 4. NR 1. At least 50% reduction in cannabis use (cannabis users only) 2. CBT/MI = 8 (NR%), PCT = 11 (32%), CAC = 14 (33%), therapist-delivered treatment (CBT/MI and PCT) = 19 (28%), CBT/MI and CAC = 22 (29%) 3. CBT/MI + CAC vs. PCT: $p = 0.751$, CAC vs. therapist-delivered treatment: $p = 0.582$ 4. NR 1. Participants using above harmful threshold (more than once weekly) (cannabis users only) 2. CBT/MI = 14 (NR%), PCT = 14 (41%), CAC = 20 (48%), therapist-delivered treatment (CBT/MI and PCT) = 28 (42%), CBT/MI and CAC = 34 (45%) 3. CBT/MI + CAC vs. PCT: $p = 0.685$, CAC vs. therapist delivered treatment: $p = 0.551$ 4. NR	

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	3 months	***6 months***
Lee 2010[45]	1. 90-day marijuana use 2. PFI: baseline mean = 9.89, 3-month mean = 9.14 (SD 14.07). Control: baseline mean = 9.84, 3-month mean = 9.06 (SD 15.78) 3. No time effect; no intervention effect ($F < 1$) 4. NR	1. 90-day marijuana use 2. PFI: 6-month mean = 11.05 (SD 18.71). Control: 6-month mean = 11.94 (SD 19.31) 3. No time effect; no intervention effect (*p* or *F* NR) 4. NR
	3 months	***6 months***
Lee 2013[46]	1. Days using cannabis past 30 days 2. brief MI mean = 14.06 (SD 10.1, $n = 86$); AO mean = 14.87 (SD 10.8, $n = 93$) 3. NS (value NR) 4. RR for brief MI brief MI vs. AO = 0.96 (95% CI 0.80 to 1.15) 1. Number joints smoked in typical week 2. Brief MI mean = 6.91 (SD 8.2, $n = 89$); AO mean = 8.45 (SD 9.8, $n = 95$) 3. $p < 0.05$ 4. RR for brief MI vs. AO = 0.76 (95% CI 0.60 to 0.96). 24% fewer for brief MI vs. AO	1. Days using cannabis past 30 days 2. Brief MI mean = 13.21 (SD 10.6, $n = 89$); AO mean = 11.68 (SD 11.1, $n = 84$) 3. NS (value NR) 4. RR for brief MI vs. AO = 1.11 (95% CI 0.85 to 1.43) 1. Number joints smoked in typical week 2. Brief MI mean = 7.26 (SD 8.4, $n = 90$); AO mean = 7.47 (SD 10.7, $n = 87$) 3. NS (value NR) 4. RR for brief MI vs. AO = 1.03 (95% CI 0.73 to 1.46)
	2 months (post treatment)	***8 months***
Litt 2013[47]	1. Longest period of initial abstinence 2. CBT/MET-9/vouchers (homework) = 18.65 (SD = 23.74), CBT/MET-9/vouchers (abstinence) = 27.95 (SD = 25.17), CaseM (= 19.45 (SD = 24.13) 3. CBT/MET-9/vouchers (abstinence) vs. CBT/MET-9/vouchers (homework): $p < 0.03$. Overall: $p = 0.06$ 4. NR 1. Continuous abstinence 2. NR 3. NS ($F = 0.97$) (treatment effect overall); $p < 0.001$ (all groups from baseline; maintained to 14 months) 4. NR	1. Abstinence in early part of follow-up (months 5–8) 2. NR 3. CaseM (vs. CBT/MET-9/vouchers (homework) and CBT/MET-9/vouchers (abstinence): $\chi^2 = 0.07$ (NS). CBT/MET-9/vouchers (homework) vs. CBT/MET-9/vouchers (abstinence): $\chi^2 = 6.13$ (significant, favours CBT/MET-9/vouchers (abstinence). Over time: $p < 0.001$ (all groups from baseline; maintained to 14 months) 4. NR 1. Proportion of days abstinent 90 days prior to follow-up 2. NR 3. CaseM-(vs. CBT/MET-9/vouchers (homework) and CBT/MET-9/vouchers (abstinence): NS. CBT/MET-9/vouchers (homework) vs. CBT/MET-9/vouchers (abstinence): $p < 0.05$, favours CBT/MET-9/vouchers (abstinence) 4. NR
	3 months	***1 year***
Madigan 2013[69]	1. Cannabis use over past 30 days 2. GPI mean = 9.9 (SD = 4.0) ($n = 36$ analysed), TAU mean = 10.1 (SD = 4.2) ($n = 18$ analysed) 3. $p = 0.86$ (between groups); also NS from baseline 4. NR	1. Cannabis use over past 30 days 2. GPI mean = 9.8 (SD = 3.9) ($n = 28$ analysed, TAU mean = 10.1 (SD = 4.0) ($n = 14$ analysed) 3. $p = 0.39$ (between groups); also NS from baseline 4. NR

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	6 weeks (post treatment)	***3 months***	
Rooke 2013[70]	1. Days of cannabis use per month 2. Internet-based CBT/MI-6 = 12.90 (SD = 8.47), internet-based written cannabis information = 14.87 (SD = 8.88) 3. $p = 0.02$ (between groups), d = 0.30, both groups $p < 0.001$ from baseline 4. NR 1. Quantity cannabis per month (SCUs – standard cannabis units = 1 joint or 3 cones) 2. Internet-based CBT/MI-6 = 39.78 (SD = 44.97), internet-based written cannabis information = 46.16 (SD = 49.31) 3. $p = 0.01$ (between groups), $d = 0.34$, both groups $p < 0.001$ from baseline 4. NR 1. Abstinence 2. Internet-based CBT/MI-6 = 7/76 (9.3%), internet-based written cannabis information = 3/73 (4.7%) 3. $p = 0.10$ 4. NR	1. Days of cannabis use per month 2. Internet-based CBT/MI-6 = 12.05 (SD = 8.99), internet-based written cannabis information = 14.11 (SD = 8.79) 3. $p = 0.02$ (between groups), $d = 0.33$, both groups $p < 0.001$ from baseline 4. NR 1. Quantity cannabis per month (SCUs – standard cannabis units = 1 joint or 3 cones) 2. Internet-based CBT/MI-6 = 36.65 (SD = 44.85), internet-based written cannabis information = 39.25 (SD = 39.21) 3. $p = 0.06$ (between groups), $d = 0.25$, both groups $p < 0.001$ from baseline 4. NR 1. Abstinence 2. Internet-based CBT/MI-6 = 8/64 (12.4%), Internet-based written cannabis information = 4/58 (6.6%) 3. $p = 0.06$ 4. NR	
	Post treatment (unknown time point)	***12 months***	
Sobell 2009[65]	1. Percentage days abstinent from cannabis (cannabis users only, at end of session four) 2. CBT/MI-4 (individual) mean = 58.79 (SD = 35.59), $n = 9$, CBT/MI-4 (group) mean = 29.47 (SD = 29.94), $n = 8$ 3. NR (between groups); $p < 0.05$ (from baseline) 4. NR	1. Percentage days abstinent from cannabis (cannabis users only) 2. CBT/MI-4 (individual) mean = 37.78 (SD = 34.02), $n = 7$, CBT/MI-4 (group) mean = 41.51 (SD = 43.10), $n = 7$ 3. NR (between groups); p = NS (from end of treatment to 12-month follow-up) 4. NR	
	1 month (post treatment)	***3 months***	***6 months***
Stein 2011[48]	1. Cannabis use 2. NR 3. OR = 0.77, $p = 0.174$ (treatment × time interaction to estimate effect of MI vs. AO) 4. NR	1. Cannabis use 2. NR 3. OR = 0.53, $p = 0.010$ 4. NR 1. Change in cannabis use per 30 days for average users 2. MI-2 = 6.58-day reduction, AO = 2.07 day/reduction (baseline to 3 months) 3. Reports that change from baseline in cannabis use was significant at 1, 3 and 6 months 4. NR	1. Cannabis use 2. NR 3. OR = 0.74, $p = 0.202$ 4. NR

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	3 months	***12 months***	
Stephens 1994[49]	1. Mean days of cannabis use per month (3 month) 2. CBT/RP-10 = 9.99 (SD = 11.50), social support group-10 = 10.71 (SD = 12.06) 3. NS (between group), both groups improved from baseline ($p < 0.001$) 4. NR 1. Percentage abstinent (3 month) 2. CBT/RP-10 = 32.5%, social support group-10 = 40.2% 3. $p < 0.10$ (between group) 4. NR	1. Days of cannabis use per month (12 month) 2. CBT/RP-10 = 14.78 (SD = 11.96), social support group-10 = 14.30 (SD = 12.29) 3. NS (between group), both groups improved from baseline ($p < 0.001$) 4. NR 1. Percentage abstinent (12 month) 2. CBT/RP-10 = 15.2, social support group-10 = 18.1 3. NS 4. NR	
	1 month (post treatment)	***4 months***	***16 months***
Stephens 2000[50] Lozano 2006[78] DeMarce 2005[79]	1. Mean days of use per week during previous 90 days 2. MI-2 = 1.6 (SD = 2.07), CBT/RP/social support-14 = 2.49 (SD = 2.32) 3. $p < 0.02$ (between groups) 4. NR 1. Use per day 2. CBT/RP/social support-14 = 2.00 (SD = 2.98), MI-2 = 0.89 (SD = 1.43) 3. $p < 0.01$ 4. NR 1. Abstinence rates for past 4 weeks 2. MI-2 42%, CBT/RP/social support-14 27% 3. $p < 0.04$ 4. NR	1. Days of use per month during last 90 days 2. CBT/RP/social support-14 mean = 6.68 (SD = 9.87), MI-2 mean = 7.88 (SD = 10.98), wait list mean = 17.09 (SD = 10.73) 3. $p < 0.001$ (wait list vs. CBT/RP/social support-14 and MI-2), p = NS (CBT/RP/social support-14 vs. MI-2) 4. NR 1. Times of use per day during last 90 days on 4-point scale 2. CBT/RP/social support-14 mean = 1.15 (SD = 1.10), MI-2 mean = 1.19 (SD = 1.18), wait list mean = 1.97 (SD = 1.09) 3. $p < 0.001$ (wait list vs. CBT/RP/social support-14 and MI-2), p = NS (CBT/RP/social support-14 vs. MI-2) 4. NR	1. Days of use per month during last 90 days 2. CBT/RP/social support-14 mean = 12.29 (SD = 12.34), MI-2 mean = 12.99 (SD = 11.61) 3. NS 4. NR 1. Times of use per day during last 90 days on 4-point scale 2. CBT/RP/social support-14 mean = 1.39 (SD = 1.15), MI-2 mean = 1.41 (SD = 1.20) 3. NS 4. NR 1. Abstinence rates for past 90 days 2. CBT/RP/social support-14 mean = 37%, MI-2 mean = 37%, wait list mean = 9% 3. $p < 0.001$ (wait list vs. CBT/RP/social support-14 and MI-2), p = NS (CBT/RP/social support-14 vs. MI-2) 4. NR 1. Abstinence rates for past 90 days (16 months) 2. CBT/RP/social support-14 mean = 29%, MI-2 mean = 28% 3. NS 4. NR

Author and year	Cannabis use (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	7 weeks (post treatment)	***6 months***	***12 months***
Stephens 2007[51]	1. Days of marijuana use per week 2. MI/personalised feedback-1 mean = 4.74 (SE = 0.24), cannabis education-1 mean = 5.44 (SE = 0.24), wait list mean = 5.75 (SE = 0.24) (95% CIs also reported) 3. $p < 0.05$ (MI/personalised feedback-1 vs. cannabis education-1 and wait list); no significant difference between cannabis education-1 and wait list (*p*-value NR) 4. NR 1. Periods smoked per day (scale of 0–4) 2. MI/personalised feedback-1 mean = 1.66 (SE = 0.11), cannabis education-1 mean = 1.90 (SE = 0.11), wait list mean = 2.20 (SE = 0.10) 3. $p < 0.05$ (MI/personalised feedback-1 vs. cannabis education-1 and wait list) 4. NR	1. Days of marijuana use per week 2. MI/personalised feedback-1 mean = 4.90 (SE = 0.27), cannabis education-1 mean = 5.22 (SE = 0.27) 3. NS ($p = 0.408$) 4. NR 1. Periods smoked per day (scale of 0–4) 2. MI/personalised feedback-1 mean = 1.84 (SE = 0.11), cannabis education-1 mean = 2.02 (SE = 0.11) 3. NS ($p > 0.05$) 4. NR	1. Days of marijuana use per week 2. MI/personalised feedback-1 mean = 4.65 (SE = 0.28), cannabis education-1 mean = 5.58 (SE = 0.28) 3. $p = 0.019$ (MI/personalised feedback-1 vs. cannabis education-1) 4. NR 1. Periods smoked per day (scale of 0–4) 2. MI/personalised feedback-1 mean = 1.79 (SE = 0.12), Cannabis education-1 mean = 1.97 (SE = 0.12) 3. NS ($p > 0.05$) 4. NR
	3 months		
Tossmann 2011[61]	1. Frequency of cannabis use over previous 30 days 2. Internet-based counselling = 16.5 (SD = 20.9), wait list = 21.0 (SD = 17.1) 3. $p < 0.001$ (between group) 4. NR 1. Quantity of grams used over previous 30 days (3 month) 2. Internet-based counselling = 13.1 (SD = 29.7), wait list = 16.5 (SD = 26.8) 3. $p = 0.003$ (between group) 4. NR		

ASSIST, Alcohol Smoking and Substance Involvement Screening Test; BI, brief intervention; BL, baseline; C, computer-delivered; CAC, clinician-assisted computerised tomography; CaseM, case management; cu, cannabis use; DTC, delayed treatment control; ES, effect size; GPI, group-based psychological intervention; MET-2, two-session; MIRP, motivational interviewing and relapse prevention; NR, not reported; NS, not significant; OR, odds ratio; OTI, opiate treatment index; PFI, individual personalised feedback; SEDP, Supportive–expressive dynamic psychotherapy; SE, standard error; T, therapist-delivered; tele-CBT, telephone-delivered CBT.

Author and year	Severity of dependence (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	4 months	***9 months***
Babor 2004[39] and Litt 2005[72] (secondary)	1. Dependence symptoms 2. Wait list = 4.36 (SD = 1.92), MET-2 = 3.70 (SD = 2.26), CBT/MET/CaseM-9 = 2.47 (SD = 2.34) 3. (Cohen's *d* statistic) MET-2 vs. wait list = 0.33, CBT/MET/CaseM-9 vs. wait list = 0.9, MET-2 vs. CBT/MET/CaseM-9 = 0.52; all between-group differences significant 4. NR 1. Mean abuse symptoms 2. wait list = 1.63 (SD = 0.91), MET-2 = 1.38 (SD = 1.10), CBT/MET/CaseM-9 = 1.03 (SD = 1.02) 3. (Cohen's *d* statistic) CBT/MET/CaseM-9 vs. wait list = 0.63, MET-2 vs. CBT/MET/CaseM-9 = 0.38, both significant; MET-2 vs. wait list = NS 4. NR	1. Dependence symptoms 2. MET-2 = 3.63 (SD = 2.08), CBT/MET/CaseM-9 = 2.81 (SD = 2.40) 3. CBT/MET/CaseM-9 vs. MET-2 = 0.31, $p < 0.01$ 4. NR 1. Mean abuse symptoms 2. MET-2 = 1.59 (SD = 1.04), CBT/MET/CaseM-9 = 1.11 (SD = 1.07) 3. CBT/MET/CaseM-9 vs. MET-2 = 0.45, $p < 0.01$ 4. NR
	14 weeks	
Budney 2000[40]	1. Drug ASI composite scores (least square means) 2. CBT/MET-14/vouchers = 0.01 (SE = 0.02), CBT/MET-14 = 0.07 (SE = 0.02), MET-4 = 0.11 (SE = 0.02) 3. $p < 0.05$ (change from baseline, all treatment groups), significant difference between MBT/MET-14 vs. MBT and MET-4 (*p*-values NR) 4. NR	
	34 weeks (median)	
Copeland 2001[53]	1. SDS scores 2. Final values: wait list mean = 9.2 (SD 3.2), MI-1 mean = 7.6 (SD 4.4), CBT-6 mean = 5.8 (SD 4.3) changes from baseline: DTC mean = –0.1, MI-1 mean = –2.2, CBT-6 mean = –3.4 (SDs for changes NR) 3. Adjusting for baseline: MI-1 vs. wait list: $p = 0.008$ (MI-1 significantly lower). CBT-6 vs. wait list: $p < 0.0001$ (MI-1 significantly lower). CBT-6 vs. MI-1: $p = 0.04$ (CBT-6 significantly lower) 4. NR	
	3 months	***6 months***
Edwards 2006[54]	1. Severity of cannabis dependence (via CASUAS, 0–4 scale) 2. CBT/MET-10 + TAU = 1.4 (SD = 1.4), psychoeducation (non-cannabis) –10 + TAU = 1.3 (SD = 1.4) 3. $p = 0.99$ (between group) 4. NR	1. Severity of cannabis dependence 2. CBT/MET-10 + TAU = 1.4 (SD = 1.4), psychoeducation (non-cannabis) –10 + TAU = 1.3 (SD = 1.5) 3. $p = 0.99$ (between group) 4. NR
	4 weeks	***12 weeks***
Gates 2012[55]	1. Cannabis dependence via SDS, 15-point scale 2. Tele-CBT/MI-4 = 4.2 (SD = 4.2), wait list = 7.1 (SD = 3.8) 3. $p < 0.001$ 4. NR	1. Cannabis dependence 2. Tele-CBT/MI-4 = 3.2 (SD = 3.8), wait list = 5.8 (SD = 4.3) 3. $p = 0.001$ 4. NR
	4 months	
Grenyer 1997[56]	1. Index of severity of symptoms 2. NR 3. $p < 0.05$, $F = 8.52$ 4. NR	

Author and year	Severity of dependence (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI	
	Post treatment	***6 months***
Hoch 2012[59] and Hoch 2008[76]	1. Mean ASI (drug use) (post treatment) 2. CBT/MET/PPS-10 = 3.0 (SD = 4.0), wait list = 8.3 (SD = 3.5) 3. CBT/MET/PPS-10: $p < 0.001$, effect size = –1.58, wait list: $p = 0.002$, effect size = –0.41 (vs. baseline) 4. NR	1. Mean ASI (drug use) 2. CBT/MET/PPS-10 = 2.5 (SD = 3.6) 3. $p < 0.001$, effect size = –1.61 (vs. baseline) 4. NR
	Post assessment	***6 months***
Hoch 2014[60]	1. Mean SDS score 2. CBT/MET/PPS-10 = 4.7 (SD = 4.2), wait list = 7.0 (SD = 4.1) 3. $p < 0.001$ (between groups) 4. $d = –0.6$, 95% CI –1.2 to 0.2 (between groups)	1. Mean SDS score 2. CBT/MET/PPS-10 = –6.1 improvement (BL 9.0,6 months 2.9), $n = 53$ 3. $p < 0.001$ (from baseline) 4. $d = 1.8$, 95% CI 1.4 to 2.9 (from baseline)
	4 months	
Jungerman 2007[63]	1. Cannabis dependence symptoms via DSM-III 2. Wait list = 5.10 (SE = 0.33), CBT/MI/RP-4 (1 month) = 4.86 (SE = 0.32), CBT/MI/RP-4 (3 months) = 4.20 (SE = 0.33) 3. $p = 0.1387$ (between all groups) 4. NR 1. Change in cannabis dependence symptoms 2. Wait list = 0.61 (SE = 0.29), CBT/MI/RP-4 (1 month) = 0.73 (SE = 0.28), CBT/MI/RP-4 (3 months) = 1.58 (SE = 0.29) 3. $p = 0.0360$ (between all groups), $p = 0.0349$ [CBT/MI/RP-4 (3 months) vs. 1 MIRP], $p = 0.0184$ [wait list vs. CBT/MI/RP-4 (3 months)], $p = 0.7577$ [wait list vs. CBT/MI/RP-4 (1 month)] 4. NR	
	All follow-up points (2, 8 and 14 months)	
Kadden 2007[44] and Litt 2008[77]	1. ASI (drug, alcohol, psychiatric subscales) 2. NR 3. No significant difference between groups, but scores on all subscales decreased over time in all groups (*p*-values NR) 4. NR	
	6 weeks	***3 months***
Rooke 2013[70]	1. Severity of dependence via SDS 2. Internet-based CBT/MI-6 = 7.31 (SD = 3.22), internet-based written cannabis information = 7.44 (SD = 3.56) 3. $p = 0.49$ (between groups), $d = 0.10$, both groups $p < 0.001$ from baseline 4. NR	1. Severity of dependence via SDS 2. Internet-based CBT/MI-6 = 5.70 (SD = 3.35), internet-based written cannabis information = 6.82 (SD = 3.31) 3. $p = 0.01$ (between groups), $d = 0.33$, both groups $p < 0.001$ from baseline 4. NR
	4 months	***16 months***
Stephens 2000,[50] Lozano 2006[78] and DeMarce 2005[79]	1. Mean number of dependence symptoms via MDS 2. CBT/RP/social support-14 = 1.96 (SD 2.73), MI-2 = 1.94 (SD 2.71), wait list = 4.63 (SD 2.59) 3. $p < 0.001$ (wait list VS MI-2 and CBT/RP/social support-14), p = NS (CBT/RP/social support-14 vs. MI-2) 4. NR	1. Mean number of dependence symptoms 2. CBT/RP/social support-14 = 2.83 (SD 3.27), MI-2 = 2.75 (SD 3.18) 3. NS 4. NR

BL, baseline; CASUAS, Cannabis and Substance Use Assessment Schedule; MDS, Marijuana Dependence Scale; MI-1, one-session MI; tele-CBT, telephone-delivered CBT.

Author and year	Cannabis problems (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI, (5) time point	
	4 months	***9 months***
Babor 2004[39] and Litt 2005[72] (secondary)	1. Cannabis problems (via MPS, 19 items) 2. Wait list = 7.77 (SD = 3.90), MET-2 = 8.35 (SD = 4.06), CBT/MET/CaseM-9 = 6.02 (SD = 4.85) 3. CBT/MET/CaseM-9 vs. wait list = 0.41, MET-2 vs. CBT/MET/CaseM-9 = 0.53, both significant; MET-2 vs. wait list = NS 4. NR	1. Cannabis problems 2. MET-2 = 7.22 (SD = 4.21), CBT/MET/CaseM-9 = 5.43 (SD = 4.31) 3. *p* = NS 4. NR
	14 weeks	
Budney 2000[40]	1. Cannabis problems (via marijuana consequences questionnaire, 0–26 scale) 2. NR 3. NS between groups; significant change from baseline in all groups (*p* NR) 4. NR	
	14 weeks (post treatment)	***12 months***
Budney 2006[41]	1. Cannabis problems (via MPS, 26 items) 2. CBT-14/vouchers mean = 3.6 (SD = 4.9); CBT-14 mean = 5.1 (SD = 4.7); voucher mean = 4.1 (SD = 4.5) 3. *p* = NS (between groups); $p < 0.01$ (for all groups from baseline) 4. NR	1. Cannabis problems (via MPS, 26 items) 2. NR 3. *p* = NS (between groups); *p* = NS (all groups over time post treatment; no change after treatment ended) 4. NR
	34 weeks (median)	
Copeland 2001[53]	1. Proportion of cannabis-related problems (via CPQ) 2. Final values: wait list mean 39.1 (SD 16.6), MI-1 mean 28.4 (SD 18.6), CBT-6 23.0 (SD = 16.8) changes from baseline: wait list mean –6.3, MI-1 mean –14.0, CBT-6 –19.4 (SDs for change NR) 3. Adjusting for baseline: CBT-6 vs. wait list: $p < 0.0001$, MI-1 vs. wait list: $p = 0.004$. CBT-6 vs. MI-1: $p = 0.08$ (all between group) 4. NR	
	4 weeks	***12 weeks***
Gates 2012[55]	1. Cannabis problems via CPQ, of 22 2. Tele-CBT/MI-4 = 3.6 (SD = 3.8), wait list = 6.5 (SD = 4.7) 3. $p < 0.001$ 4. NR	1. Cannabis problems 2. Tele-CBT/MI-4 = 3.6 (SD = 4.4), wait list = 5.3 (SD = 4.5) 3. $p = 0.006$ 4. NR
	Post assessment	
Hoch 2014[60]	1. Mean number cannabis dependence symptoms 2. CBT/MET/PPS-10 = 0.9 (SD = 1.6), wait list = 2.4 (SD = 2.1) 3. $p < 0.001$ (between groups) 4. d = –0.9, 95% CI –1.1 to –0.5 (between groups) 1. Mean CPQ scores 2. CBT/MET/PPS-10 = 2.9 (SD = 3.8), wait list = 5.6 (SD = 4.4) 3. $p < 0.001$ (between groups) 4. d = –0.7, 95% CI –1.3 to 0.2 (between groups) 1. Mean CUPIT score 2. CBT/MET/PPS-10 = 27.1 (SD = 14.1), wait list = 37.1 (SD = 14.7) 3. $p < 0.001$ (between groups) 4. d = –0.7, 95% CI –2.9 to 2.1	

Author and year	Cannabis problems (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI, (5) time point	
	4 months	
Jungerman 2007[63]	1. Mean marijuana problems via MPS (19 items) 2. Wait list = 8.92 (SE = 0.64), CBT/MI/RP-4 (1 month) = 9.54 (SE = 0.61), CBT/MI/RP-4 (3 months) = 8.52 (SE = 0.63) 3. $p = 0.5070$ (between all groups) 4. NR 1. Change in mean marijuana problems 2. Wait list = 0.79 (SE = 0.46), CBT/MI/RP-4 (1 month) = 0.26 (SE = 0.43), CBT/MI/RP-4 (3 months) = 1.69 (SE = 0.45) 3. $p = 0.0753$ (between all groups) 4. NR 1. Mean ASI drug composite score 2. Wait list = 2.81 (SE = 0.21), CBT/MI/RP-4 (1 month) = 2.77 (SE = 0.20), CBT/MI/RP-4 (3 months) = 2.10 (SE = 0.21) 3. $p = 0.0238$ (between all groups) 4. NR 1. Change in mean ASI drug composite score 2. Wait list = 0.57 (SE = 0.23), CBT/MI/RP-4 (1 month) = 0.10 (SE = 0.22), CBT/MI/RP-4 (3 months) = 0.92 (SE = 0.23) 3. $p = 0.0411$ (between all groups), $p = 0.0121$ [CBT/MI/RP-4 (3 months) vs. CBT/MI/RP-4 (1 month)], $p = 0.2921$ (wait list vs. 3 MIRP), $p = 0.1460$ [wait list vs. CBT/MI/RP-4 (1 month)] 4. NR	
	2 months (post treatment) and 14 months	
Kadden 2007[44] and Litt 2008[77]	1. Mean problem score 2. Across all groups: mean of 14 at baseline and < 8 post treatment (2 months) and throughout 14 months 3. No significant difference between groups, but decreased over time in all groups post treatment and throughout 14 months ($p < 0.001$) 4. NR	
	3 months	***6 months***
Lee 2010[45]	1. Marijuana-related problems (of 18) 2. Internet-based-personalised feedback-1: baseline mean = 2.11, 3-month mean = 2.47 (SD 3.77). AO: baseline mean = 1.86, 3-month mean = 1.99 (SD 2.76) 3. No time interactions; no time by treatment interactions (BL to 3 month) 4. NR	1. Marijuana-related problems (of 18) 2. Internet-based-personalised feedback-1: 6-month mean = 2.59 (SD 3.96). AO: 6-month mean = 2.19 (SD 2.95) 3. No time interactions; no time by treatment interactions (BL to 6 month) 4. NR
	3 months	***6 months***
Lee 2013[46]	1. Number of cannabis-related problems 2. Brief MI-1 mean = 7.84 (SD 5.0, $n = 87$); AO mean = 8.67 (SD 6.0, $n = 90$) 3. $p < 0.10$ 4. RR for brief MI-1 vs. AO = 0.90 (95% CI 0.76, 1.07). 10% fewer problems in intervention group compared with control	1. Number of cannabis-related problems 2. brief MI-1 mean = 6.54 (SD 5.3, $n = 82$); AO mean = 6.75 (SD 6.5, $n = 83$) 3. NS (value NR) 4. RR for brief MI-1 vs. AO = 1.15 (95% CI 0.90 to 1.47)

Author and year	Cannabis problems (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI, (5) time point		
	End of treatment		
Litt 2013[47]	1. MPS score 2. NR 3. NS ($F = 0.02$) (treatment effect); $p < 0.001$ (all groups from baseline; maintained to 14 months) 4. NR		
	3 months	***12 months***	
Stephens 1994[49]	1. Mean number of problems via modified DAST 2. CBT/RP-10 = 2.11 (SD = 2.59), social support group-10 = 2.48 (SD = 3.53) 3. NS (between group), both groups improved from baseline ($p < 0.001$) 4. NR	1. Mean number of problems 2. CBT/RP-10 = 3.27 (SD = 3.41), social support group-10 = 2.97 (SD = 3.64) 3. NS (between group), both groups improved from baseline ($p < 0.001$) 4. NR	
	4 months	***16 months***	
Stephens 2000[50] Lozano 2006[78] DeMarce 2005[79]	1. Mean number of cannabis-related problems via list of 19 problems 2. CBT/RP/social support-14 3.50 (SD = 4.23), MI-2 3.26 (SD = 3.99), wait list 7.89 (SD = 4.23) 3. $p < 0.001$ (wait list vs. CBT/RP/social support-14 and MI-2), p = NS (CBT/RP/social support-14 vs. MI-2) 4. NR	1. Mean number of cannabis-related problems 2. CBT/RP/social support-14 4.21 (SD = 4.98), MI-2 4.71 (SD = 4.74) 3. NS 4. NR	
	7 weeks	***6 months***	***12 months***
Stephens 2007[51]	1. Number of problems (scale 0–19 based on MPS) (7 week) 2. MI/personalised feedback-1 mean = 3.70 (SE = 0.41), cannabis education-1 mean = 5.03 (SE = 0.41), wait list mean = 5.01 (SE = 0.40) 3. NS ($p > 0.05$) 4. NR	1. Number of problems 2. MI/personalised feedback-1 mean = 4.06 (SE = 0.41), cannabis education-1 mean = 5.46 (SE = 0.41) 3. NS ($p > 0.05$) 4. NR	1. Number of problems 2. MI/personalised feedback-1 mean = 3.95 (SE = 0.40), cannabis education-1 mean = 5.21 (SE = 0.40) 3. NS ($p > 0.05$) 4. NR

BL, baseline; CUPIT, Cannabis Use Problems Identification Test; DAST, Drug Abuse Screening Test; DTC, delayed treatment control; NR, not reported; NS, not significant; tele-CBT, telephone-delivered CBT; URICA, University of Rhode Island Change Assessment Scale.

Author and year	Motivation to change (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI		
	3 months	***6 months***	***12 months***
Bonsack 2011[66]	1. Readiness to change (scale 0–100) 2. CBT/MI-6 + TAU median = 68.7, TAU median = 50 3. $p = 0.31$ 4. NR	1. Readiness to change (scale 0–100) 2. CBT/MI-6 + TAU median = 62.5, TAU median = 50 3. $p = 0.52$ 4. NR	1. Readiness to change (scale 0–100) 2. CBT/MI-6 + TAU median = 56.25, TAU median = 50 3. $p = 0.40$ 4. NR
	1. Importance of change (scale 0–100) 2. CBT/MI-6 + TAU median = 62.5, TAU median = 37.5 3. $p = 0.08$ 4. NR	1. Importance of change (scale 0–100) 2. CBT/MI-6 + TAU median = 50, TAU median = 50 3. $p = 0.50$ 4. NR	1. Importance of change (scale 0–100) 2. CBT/MI-6 + TAU median = 50, TAU median = 50 3. $p = 0.58$ 4. NR
	1. Confidence to change (scale 0–100) 2. CBT/MI-6 + TAU median = 75, TAU median = 50 3. $p = 0.02$ 4. NR	1. Confidence to change (scale 0–100) 2. CBT/MI-6 + TAU median = 75, TAU median = 50 3. $p = 0.05$ 4. NR	1. Confidence to change (scale 0–100) 2. CBT/MI-6 + TAU median = 75, TAU median = 60 3. $p = 0.12$ 4. NR
	14 weeks		
Budney 2000[40]	1. URICA scores (least square means) 2. CBT/MET-14/vouchers = 8.5 (SE = 0.56), CBT/MET-14 = 8.6 (SE = 0.45), MET-4 = 6.6 (SE = 0.64) 3. $p < 0.05$ (M-4 group, change from baseline. All other changes from baseline NS) 4. NR		
	3 months		***6 months***
Edwards 2006[54]	1. Change in readiness to change categories 2. NR 3. $p = 0.68$ (between group) 4. NR		1. Change in readiness to change categories 2. NR 3. $p = 0.72$ 4. NR
	2 months (post treatment)		***14 months***
Kadden 2007[44] and Litt 2008[77]	1. (Reported by Litt[77]) mean readiness to change score 2. Pre scores: CaseM = 13.84 (SD = 2.39), MET/CBT = 14.76 (SD = 3.41), ContM = 14.32 (SD = 4.11), MET/CBT + ContM = 14.63 (SD = 3.50). post scores: CaseM = 14.29 (SD = 4.14), MET/CBT = 15.59 (SD = 4.44), ContM = 15.82 (SD = 4.54), MET/CBT + ContM = 15.71 (SD = 3.32) 3. *F*-value = 1.37 (NS) (between groups) 4. NR		1. (Reported by Litt[77]) mean coping strategies score 2. Pre scores: CaseM-9 = 2.16 (SD = 0.47), CBT/MET-9 =2.05 (SD = 0.48), vouchers = 2.14 (SD = 0.51), CBT/MET-9CBT/MET-9/vouchers = 2.18 (SD = 0.47). Post scores: CaseM-9 = 2.45 (SD = 0.63), CBT/MET-9 = 2.50 (SD = 0.61), vouchers = 2.46 (SD = 0.61), CBT/MET-9CBT/MET-9/vouchers = 2.58 (SD = 0.62) 3. *F*-value = 0.48 (NS) (between groups), significant effect of time ($p < 0.001$, BL to 14 months) 4. NR
	1. (Reported by Litt[77]) mean readiness to change score 2. Pre scores: CaseM-9 = 65.56 (SD = 25.14), CBT/MET-9 = 65.84 (SD = 26.1), vouchers = 70.27 (SD = 24.54), CBT/MET-9CBT/MET-9/vouchers = 65.29 (SD = 26.89). Post scores: CaseM-9 = 83.81 (SD = 36.19), CBT/MET-9 = 91.79 (SD = 33.38), vouchers = 90.83 (SD = 30.49), CBT/MET-9CBT/MET-9/vouchers = 81.02 (SD = 32.67) 3. *F*-value = 1.04 (NS) (between groups) 4. NR		

Author and year	Motivation to change (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI
	Post treatment
Litt 2013[47]	1. Readiness to change action subscale 2. NR 3. $p < 0.001$ (BL to post treatment). NS differences by treatment 4. NR
	7 weeks
Stephens 2007[51]	1. RCQ (RTC) 2. NR 3. No significant difference between groups (*p*-values NR). Overall, greater efforts at making changes at 7 weeks than initial assessment on RTC action subscale ($p = 0.004$) 4. NR
	3 months
Tossmann 2011[61]	1. Use-related self efficacy 2. Internet-based counselling = 51.1 (SD = 45.0), wait list = 43.3 (SD = 39.0) 3. $p < 0.001$ (between group) 4. NR

BL, baseline; CASUAS, Cannabis and Substance Use Assessment Schedule; ContM, contingency management; MDS, Marijuana Dependence Scale; NR, not reported; NS, not significant; RTC, readiness to change; URICA, University of Rhode Island Change Assessment Scale.

Author and year	Attendance/compliance/dropout rates (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI, (5) time point
Babor 2004[39] and Litt 2005[72] (secondary)	1. Mean number sessions attended 2. MET-2 = 1.6 of 2. CBT/MET/CaseM-9 = 6.5 of 9 3. NR 4. NR 5. End of treatment
	1. % attending all sessions 2. MET-2 = 71.9%, CBT/MET/CaseM–9 = 47.0% 3. NR 4. NR 5. End of treatment
Baker 2006[52]	Cannabis subgroup: NR all participants:
	1. Number treatment sessions attended 2. CBT/MI-10 + TAU: 88% attended some or all, 71% attended all 10 (TAU: N/A) 3. N/A 4. N/A 5. 10 weeks
Bonsack 2011[66]	1. Attendance at sessions 2. 5.13 of 6 CBT/MI-6 + TAU sessions over first 6 months; four participants received between 7 and 12 sessions; two participants received only three sessions 3. NR 4. NR 5. 6 months
Budney 2000[40]	1. Participants attending more than one session 2. CBT/MET-14/vouchers = 100%, CBT/MET-14 = 95%, MET-4 = 85% 3. Chi-squared statistic = 1.3 (NS) 4. NR 5. End of treatment
	1. Treatment retention (participants attending > one sessions and providing one urine sample during the final 2 weeks) 2. CBT/MET-14/vouchers = 55%, CBT/MET-14 = 65%, MET-4 = 45% 3. Chi-squared statistic = 1.6 (NS) 4. NR 5. End of treatment
Budney 2006[41]	1. Number treatment sessions attended 2. CBT-14/vouchers = 9.6 of 14; CBT-14 = 8.8 of 14 3. $p = 0.50$ 4. NR 5. 14 weeks
	1. Number of weeks retained in treatment 2. CBT-14/vouchers = 10.7 of 14; CBT-14 = 9.3; vouchers = 9.5 3. $p = 0.57$ 4. NR 5. 14 weeks
Copeland 2001[53]	1. Likelihood in participating in follow-up 2. Overall 170/229 (74.2%) had follow-up data (% per group NR) 3. No difference between groups (*p*-values NR) 4. NR 5. Median 34 weeks after last treatment
	1. Number treatment sessions attended 2. CBT-6 = mean 4.2 out of 6, 50% attended all 6; MI-1, 87.8% attended the session, overall 69.4% participants attended the sessions they were randomised to 3. NR 4. NR 5. NR

Author and year	Attendance/compliance/dropout rates (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI, (5) time point
de Dios 2012[43]	1. Attendance at sessions 2. 100% ($n = 22$) attended first session, 73% ($n = 16$) attended second session 3. NR 4. NR 5. End treatment
Edwards 2006[54]	1. Number of sessions attended 2. CBT/MI-10 + TAU: mean = 7.6, SD = 2.8, psychoducation (non-cannabis)–10 + TAU: mean = 8.4, SD = 2.5 3. $p = 0.20$ (between group) 4. NR 5. N/A
Gates 2012[55]	1. Average sessions attended 2. 3.25 (SD = 1.2) of 4 3. NR 4. NR 5. End of treatment
Hjorthoj 2013[68] and Hjorthoj 2012[80]	1. Attendance at sessions 2. Average attendance: 16/24 sessions. Attendance at zero sessions: $n = 3$ (5.8%), attendance at least right sessions: 77% (*n* NR) 3. NR 4. NR 5. End treatment
Hoch 2012[59] and Hoch 2008[76]	1. Retention in treatment 2. 86% retained in treatment 3. NR 4. NR 5. End treatment
Hoch 2014[60]	1. Participants completing 10 sessions (not clear that completed all 10) 2. CBT/MET/PPS-10: 166/255 (65%) 3. NR 4. NR 5. End treatment
Humeniuk 2012[71]	1. 100% received brief MI-1 or wait list
Jungerman 2007[63]	1. Attendance at all four sessions 2. CBT/MI/RP-4 (1 month) = 86%, CBT/MI/RP-4 (3 months) = 67% 3. NR 4. NR 5. 4 months
Kadden 2007[44] and Litt 2008[77]	1. Mean number sessions attended 2. 5.2 out of 9 (over all groups) 3. No difference ($p > 0.36$) 4. NR 5. Post treatment (2 months)
Kay-Lambkin 2009[57]	1. Average number sessions attended (all participants) 2. CBT/MI-10 = 8.71 of 10 (SD = 2.74), computer-delivered CBT/MI + brief therapist-10 = 7.61 of 10 (SD = 2.87) 3. $p = 0.20$ (between group) 4. NR 5. End treatment
	1. Participants attending all allocated sessions (all participants) 2. CBT/MI-10 = 78% ($n = 18$), computer-delivered CBT/MI + brief therapist-10 = 52% ($n = 12$) 3. $p = 0.122$ 4. NR 5. End treatment

Author and year	Attendance/compliance/dropout rates (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI, (5) time point
Kay-Lambkin 2011[58]	1. Mean number sessions attended (all participants) 2. CBT/MI-10 = 6.1, computer-delivered CBT/MI + brief therapist-10 = 5.3, PCT-10 = 5.4 3. $p = 0.353$ 4. NR 5. End treatment
	1. Percentage attending all sessions (all participants) 2. CBT/MI-10 = 34% (30/88), computer-delivered CBT/MI + brief therapist-10 = 30% (29/97), PCT-10 = 30% (27/89) 3. NR 4. NR 5. End treatment
Lee 2013[46]	1. Attendance at session in person 2. 58/106 (55%) 3. N/A 4. N/A 5. Treatment
	1. Attendance at session in person or mailed personalised feedback 2. 90/106 (85%) 3. N/A 4. N/A 5. Treatment
Litt 2013[47] and Litt 2013[47]	1. Mean number attended sessions (of nine) 2. CBT/MET-9/vouchers (homework) = 5.7 (SD = 3.5), CBT/MET-9/vouchers (abstinence) = 5.5 (SD = 3.8), CaseM-9 = 6.0 (SD = 3.5) 3. $p > 0.75$ 4. NR 5. End treatment
	1. Completion of treatment assignments 2. CBT/MET-9/vouchers (homework) = 50.2%, CBT/MET-9/vouchers (abstinence) = 31.7% 3. $p < 0.01$ (between groups) 4. NR 5. End treatment
Madigan 2013[69]	1. Received intervention 2. CBT/MI-12 (group): 27/59 received intervention (remainder declined). TAU: 100% received 3. NR 4. NR 5. 3 months
Rooke 2013[70]	1. Number of modules completed 2. Internet-based CBT/MI-6: 3.5 of 6, internet-based written cannabis information NR 3. NR 4. NR 5. End of treatment
Stein 2011[48]	1. Attendance at MI sessions 2. Receiving two sessions = 131 (80%), receiving one session = 16 (10%), receiving 0 sessions = 16 (10%) 3. NR 4. NR 5. End of treatment
Stephens 1994[49]	1. Difference in attendance rates 2. NR per group (across groups, mean number of sessions attended = 7.6 of 10; attendance at > = seven sessions = 69% 3. NS 4. NR 5. End treatment

Author and year	Attendance/compliance/dropout rates (1) outcome measure, (2) absolute values (mean/median, SD/SE), (3) *p*-values (groups/baseline), (4) between group difference and CI, (5) time point
Stephens 2000,[50] Lozano 2006[78] and DeMarce 2005[79]	1. Average sessions attended 2. CBT/RP/social support-14 = 8.42 of 14 3. NR 4. NR 5. 18 weeks 1. Attendance at > = 10 OF 14 RPSG sessions 2. CBT/RP/social support-14; 50% 3. NR 4. NR 5. 18 weeks 1. Attendance at both IAI sessions 2. 86% (*n* = 76) 3. NR 4. NR 5. 1 month
Stephens 2007[51]	1. Likelihood of attending single treatment session 2. MI/personalised feedback-1 89%, cannabis education-1 94% 3. NR 4. NR 5. 1 week
Tossmann 2011[61]	1. Dropout of QTS group 2. 503/863 randomised but declined participation, 183/360 discontinued intervention before end of 50-day period 3. NR 4. NR 5. NR

CaseM, case management; IAI, individualised assessment and intervention; N/A, not applicable; NR, not reported; NS, not significant; QTS, quit the shit; RPSG, relapse prevention support group.

Appendix 5 Patient and public involvement: service user briefing document

CANNABIS PROJECT INTRODUCTORY DOCUMENT

- What research are we undertaking?
  We are looking to see if psychotherapy treatments (like CBT) are good at treating people who are addicted to cannabis.

- How are we doing the research?
  We are undertaking what is called a "systematic review", which means that we are looking at all the research that has been undertaken in this area and summarising all the results. This allows us to say whether or not the treatment works. We are not actually treating patients, we are just looking at research that has already been done.

- Why are we doing this research?
  Currently there are lots of ways of treating people for cannabis addiction – we do not know which is best. This review will allow us to understand which treatment is the best at reducing, or stopping, cannabis usage for people who regularly use cannabis.

- How is a systematic review undertaken?
  - First we develop a document which describes how we are undertaking the systematic review – this is called the **'protocol'**. Because there has been so much research in this area, we have to narrow down what we are going to look at. In the protocol document, we describe the treatments we are going to look at and the measures by which the treatments will be assessed. We also describe how we are going to locate the previous research.
  - We then search for all the research that has been done in this area.
  - The research is summarised, and the results from all the different studies are bought together.
  - We then write up the research and describe what we have found, in a **'report'**.

- What input will we need from you, the service user?
  We will show you sections of the protocol and report. We will describe what is written and ask you if you have any thoughts on it – don't worry if you don't have anything to say, just say so. We are looking for anything that you think is important to add – don't worry if you are not sure if it is relevant or important - any input we receive will be useful.

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