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A systematic review of cognitive and/or behavioural therapies for methamphetamine dependence

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Abstract

Introduction and aims—The use of methamphetamine is widespread and poses significant challenges for treatment providers. Much of the treatment knowledge about this group has been extrapolated from studies of treatment for cocaine dependence. Medications have been shown to be of limited effectiveness for methamphetamine users, making psychological interventions the treatment of choice.

Design and methods—This paper describes a systematic review of cognitive-behavioural and behavioural interventions for methamphetamine users. A systematic search of published literature was undertaken focusing only on randomised trials.

Results—There were a relatively small number of intervention studies that compared cognitive-behavioural or behavioural interventions using randomised trial methodology. Most commonly, studies examined cognitive behaviour therapy (CBT) and/or contingency management (CM). Treatment with CBT appears to be associated with reductions in methamphetamine use and other positive changes, even over very short periods of treatment (2 and 4 sessions). CM studies found a significant reduction of methamphetamine during application of the procedure, but it is not clear if these gains are sustained at post-treatment follow-up.

Discussion and conclusion—Further research into cognitive behavioural and behavioural treatments for methamphetamine users is required, with a focus on improving longevity of the effect of intervention.

Keywords

methamphetamine; cognitive behaviour therapy; behavioural therapy; systematic review

Introduction

There is growing concern about the use of methamphetamine in many countries and presentations to treatment services are reportedly increasing. Methamphetamine is the most widely used illicit drug in the world after cannabis [1]. Australia has one of the highest rates of methamphetamine use in the world and high rates of injecting which lead to greater morbidity among this group. Nearly 10% of Australian adults having tried the drug, and

more than 3% having used in the last year [2]. In the USA, nearly half a million people use methamphetamines each week.

A number of harms from methamphetamine use have been identified including psychological and psychiatric morbidity, unsafe sexual practices, medical and neurological complications, and elevated HIV risk [3]. In Australia, for example, the number of hospital separations for a psychostimulant related psychotic disorder increased from 200 in 1998–99 to 1,510 in 2004–05 after reaching a peak of 1,626 in 2003–04 [4].

Yet, despite its widespread use and associated problems, treatments with known efficacy are not widely available. In spite of much effort, no pharmacological interventions have been identified to date that are effective for treating the withdrawal syndrome that emerges when methamphetamine use is discontinued, nor in assisting in achievement or maintenance of abstinence from methamphetamine. Thus, psychological treatments become of increasing importance in the options for intervention.

A number of reviews have been undertaken in recent years (eg, [5]; [6]) and have concluded that psychological interventions are effective for stimulant users. However, none of these reviews have specifically examined results of these interventions with methamphetamine users. In fact, the majority of these studies have been among cocaine users.

It is becoming increasingly evident that there are some distinct differences between users of cocaine and methamphetamine. Huber et al [7], for example, has found important differences between treatment seekers using methamphetamine and cocaine, including age of first use, route of administration and frequency of use and prior exposure to treatment, although overall outcomes from an identical manualised treatment were similar.

Given these differences, extrapolating findings from studies of cocaine users to amphetamine users may not give a true picture of the effectiveness of treatments. This review focuses on randomised trials of cognitive and/or behavioural interventions for methamphetamine users.

Method

Cognitive and/or behavioural therapies

There are a number of therapies that are considered cognitive and/or behavioural in nature. These include Cognitive Therapy, Cognitive Behavioural Therapy and behavioural therapies such as Contingency Management.

Cognitive behaviour therapy (CBT) is a form of “talk therapy” based on principles of conditioning and learning that is used to teach, encourage, and support individuals about how to reduce/stop their harmful drug use. CBT provides skills that are valuable in assisting people in gaining initial abstinence from drugs (or in reducing their drug use) and provides skills to help people sustain abstinence (relapse prevention). CBT is an umbrella term that encompasses a range of interventions that may be quite different in application and focus [8]. Within the stimulant treatment area, specific CBT protocols have been tested [8–10]; relapse prevention [11] and coping skills therapy [12] are the most widely known and

commonly practiced approaches. Cognitive therapy (CT) is very similar, but there is more emphasis on the cognitive components of therapy.

Among the wider mental health area an even broader array of techniques are included under the definition of cognitive behaviour therapy, including the so-called 'third wave' therapies such as mindfulness based cognitive therapy.

Contingency management (CM) is a behavioural technique based on the systematic application of principles of positive reinforcement. It most often involves the delivery of vouchers, exchangeable for money or desired commodities, contingent upon some desired behaviour (eg. a drug free urine sample). It has been extensively researched in the USA.

This review included any therapies that come under the cognitive and/or behavioural approach, including cognitive therapies, cognitive behavioural therapies and behavioural therapies.

Search strategy

A systematic literature review was conducted using a 'Supersearch' search engine, which searches multiple databases simultaneously. The collection includes MDHS e-resource Trials, Web of Science (ISI), MEDLINE (ISI), CINAHL PLUS (EBSCO), BIOSIS Previews (ISI), PubMed and PsycINFO (CSA). Supplementing this, the search was also repeated directly on the MEDLINE (ISI) and PsycINFO (CSA). A search of Google Scholar was also conducted.

We chose to use a very inclusive definition of cognitive and/or behavioural interventions. Therefore the following terms were searched to identify studies of treatments that fall under the cognitive and/or behavioural group of therapies for methamphetamine abuse and dependence: CBT, cognitive therapy, behavio(u)r therapy, schema therapy, acceptance and commitment therapy, contingency management, motivational incentives, dialectical behaviour therapy, mindfulness, cue exposure, relapse prevention, coping skills and node link therapy. These results were then combined for the search term 'methamphetamine or amphetamine or stimulant' to identify studies including treatment for methamphetamine use. Studies were limited to peer-reviewed journal publications in English. Articles were hand searched and only those using randomised trial methods, or reporting systematic or meta-analytic reviews were included in this review (see Table 1).

Results

Table 2 summarises randomised studies that met the criteria for inclusion in this review.

Relapse prevention

In the first brief intervention trial specifically for methamphetamine users, Baker et al [13] compared 2 and 4 sessions of motivational interviewing (MI) plus CBT with a self-help booklet control group. There were 64 participants in this pilot study. They found an overall decrease in methamphetamine use across the groups and a significant increase in abstinence in the treatment groups compared to the control.

In a larger replication of this study Baker et al [14] found similar results. In addition they found that the 4-session group also showed a significant decrease in depression post treatment, although the effect was lost by the 6 month follow-up. The self-help booklet was based on CBT and may go some way to explain why there was little difference between groups. The authors suggested that the intensity of the assessment and the multiple follow-ups may have had a treatment effect and recommended at least thorough assessment and assertive follow-up for this group.

In a multi-site study using the Matrix Model, Rawson et al [15] compared treatment as usual with the multi-component treatment, which includes group CBT, group family education, group social support and individual counselling over 16 weeks. Both groups improved significantly. Matrix treatment resulted in increased attendance, more drug free urine samples and longer periods of abstinence during treatment in all but a drug court site; however the difference between the groups was lost at follow-up.

Yen et al. [16] compared 5 sessions of MI and relapse prevention (RP) among 67 methamphetamine users and 78 heroin users. The nature of the control group was not clearly stated, but appears to be a no-treatment control. The participants had been arrested for drug use in Taiwan and required by law to attend a 3–4 week government run detoxification program. The main outcome measured was self efficacy using the Situational Confidence Questionnaire [17] and results showed an increase in self efficacy among the intervention group compared to the control, although analyses were not performed separately for the different drug types and no drug use outcomes were reported.

Contingency management

Contingency management (CM) uses positive reinforcement to reward achievement of goals in treatment, most commonly abstinence. Typically incentives include vouchers exchangeable for goods or privileges and cash rewards for behaviours such as attendance at treatment sessions or a drug-negative urine specimen. CM has been widely applied to other drug dependence disorders in the US but is not widely used in Australia. Studies have consistently shown strong evidence of efficacy across drug types, although long term follow-ups are uncommon and there is some reduction in the treatment benefits at post treatment follow up once the contingencies have been removed.

Rawson et al [18] compared CM with CBT with a combined CM+CBT treatment for a sample of stimulant users that included both methamphetamine and cocaine users. In this study, the CM condition consisted of a contingency whereby the provision of stimulant-free urine samples, collected three times per week, could earn vouchers worth a total of \$1200 over a 16 week trial. CBT was delivered in thrice weekly group sessions over a similar 16 week period. In a third condition, participants received both the voucher contingency and the CBT group sessions. Participants were cocaine and methamphetamine users and the 2 stimulant use groups were not separated in the analysis. Study results demonstrated a reduction in stimulant use for all groups CM produced significantly increased retention and reduced stimulant use during the treatment period, although there was no difference between the groups at follow-up.

Peirce et al [19] randomised 388 methamphetamine users enrolled in methadone maintenance treatment (MMT) to usual care with or without incentives for 12 weeks. Usual care consisted of MMT and individual and group counselling as required by the clinic, up to 3 times a week in this sample. In the incentive group, participants could draw for prizes each time they tested negative for cocaine, amphetamine methamphetamine or alcohol. Participants drew a token that read either good job (50%), small (41.8%), large (8%) or jumbo (0.2%). Good job tokens came with no prize; prizes ranged in value from \$1 (small) to \$100 (jumbo). The number of draws available per participant increased by one each week all tests were submitted and all negative. Draws reset to 1 if unexplained missed session or positive sample produced. Results showed that stimulant free urines were twice as likely in the CM group than the usual care group. Continuous abstinence for 4,8 and 12 weeks was more likely for the incentive group. There was no follow-up post treatment reported.

In a study of 415 methamphetamine and cocaine users, comparing usual care with and without 'abstinence incentives', Petry et al [20] found a significant increase in treatment retention, higher rates of continuous abstinence and significant increase in stimulant free urine samples in CM group. Their results were not analysed by drug type and it is unclear what the proportion of methamphetamine compared to cocaine users was in the sample. They used a similar procedure for the incentive condition to the Peirce et al [19] study. They did not analyse the results by drug type. No follow-up beyond the intervention period as undertaken.

Roll et al [21] randomised 113 participants who used methamphetamine to 12 weeks of treatment as usual (TAU) or TAU plus CM. The CM group showed a significantly greater increase in methamphetamine free urine samples and were abstinent for longer, but there was no difference in treatment retention between the groups.

In a variation on CM, Shoptaw et al [22] compared the antidepressant sertraline or a placebo with and without CM. There were no main effects of sertraline or of CM, but the sertraline only group showed fewer weeks of abstinence, poorer retention and attended fewer relapse prevention groups.

CBT approaches for specific groups of methamphetamine users

In a series of papers drawn from a common dataset, Shoptaw et al. [23], Peck et al. [24] and Jaffe et al. [25] compared 4 combinations of CBT and CM, including a gay-specific CBT (CBT alone, CM alone, CBT +CM, gay-specific CBT alone) intervention for gay and bisexual men who were methamphetamine dependent. All interventions were associated with reductions in self-reported methamphetamine use up to one year post treatment.

Shoptaw et al [23] found increases in treatment retention, longest period of consecutive methamphetamine-negative urine test and treatment effectiveness score of the Addiction Severity Index [26] in the groups that included CM (CM only and CBT+CM). These groups also showed fewer missing urine screen tests. Those in the CBT+ CM group earned significantly more incentive payouts than those in the CM only group and attended significantly more sessions than those in the CBT only group.

Peck et al [24] noted that depression improved post treatment across the groups and there was no influence of HIV status on these results. The CBT only group showed higher levels of depression at one year post treatment, but had higher premorbid rates of major depressive disorder. There was no greater effect of gay-specific CBT for this population over other conditions.

Cue exposure

There were no randomised studies identified of cue exposure treatments for methamphetamine users.

Newer cognitive behavioural approaches

There were no studies of newer cognitive behavioural therapies, such as mindfulness based cognitive therapy (MBCT), dialectical behaviour therapy (DBT) or schema therapy.

Other cognitive behavioural approaches

There were no randomised trials of other cognitive behavioural approaches such as Community Reinforcement Approaches (CRA).

Discussion

There are a limited number of studies using randomised trial methods examining interventions for methamphetamine users. Much of the research literature with stimulant users has been focused on cocaine, and even when methamphetamine users are included, many of the studies involved a mixed sample of cocaine and methamphetamine users.

The studies by Baker and colleagues [13] [14] and Yen et al [16] suggest that a combination of MI and CBT is useful in increasing abstinence and self efficacy to quit, and that even very brief interventions may be effective. All of these studies combined motivational interviewing with CBT, but did not compare the two.

Studies of CM have consistently demonstrated substantial benefits (eg, reduced drug use) during treatment. The degree to which the benefits of CM are sustained once the vouchers are discontinued is unclear. Some studies did not include a follow-up beyond the treatment phase, therefore the durability of the treatment effect was impossible to determine. In other studies, the magnitude of the reduction in methamphetamine use appears to diminish at post treatment follow up points. The importance of post-treatment durability of effects of psychosocial treatments has been questioned by McLellan [27]. He suggests that in the evaluation of pharmacotherapies, efficacy is defined by the degree of effect during the medication period (in comparison to a placebo condition). With addiction medications, there is no assumption that the temporary application of a medication within a research protocol will engender treatment effects beyond the medication period. McLellan challenges the idea that for a psychosocial treatment to demonstrate efficacy, the central consideration is whether it demonstrates a measurable therapeutic benefit, compared to a control condition during the period in which the treatment is being delivered. With this perspective, the treatment effects of CM appear to be quite substantial.

When studies compared CM and CBT, and the addition of CBT did not appear to enhance the treatment outcomes over the CM only condition. It should be noted however, that in these studies, the combined CM plus CBT conditions merely delivered the two interventions in parallel. No attempt was made to integrate the CM and CBT interventions such that CM contingencies were applied to specific targeted CBT behaviour changes. A more integrated application of CM and CBT might provide a more powerful synergistic effect.

Among these studies, abstinence was often the only significant drug use outcome, suggesting that an abstinence goal is viewed as an important for methamphetamine users. However, studies on the usefulness of these interventions to reduce use and associated harm is an important area for future study .

Based on the studies reviewed, methamphetamine use appears to be reactive to a number of CBT and CM treatments. In many studies the control group also made significant reductions in methamphetamine use. Baker et al [14] noted that assessment and assertive follow-up alone may have a significant impact on use and recommend that it should be a routine part of good clinical practice with methamphetamine users. In this study, a self-help booklet was effective in increasing abstinence and may be a valuable initiation into treatment for methamphetamine users. The use of assessment, follow-up and a self-help booklet may be good practical advice for a group that is considered to attend treatment for relatively short periods.

There were no studies of newer cognitive behaviour therapies, such as mindfulness based cognitive therapy, dialectical behaviour therapy or schema therapy. Schema therapy is not thought to be suitable for drug users who have not achieved some period of abstinence (J. Young, pers. comm.), but given the high rates of comorbid personality disorder and depression among methamphetamine users [28] studies with methamphetamine users with MBCT and DBT interventions may prove useful.

Despite the high prevalence of mental health symptomatology, there were also no studies of the effectiveness of mental health intervention for methamphetamine users and research is urgently required in this area. In particular, depression is highly prevalent among this group and also responds well to psychological treatment. Baker et al [14] showed that amphetamine-only brief intervention had some impact on symptoms of depression among regular methamphetamine users, signalling potential for an approach directed towards addressing depression as well as methamphetamine use. In the studies by Rawson et al [15, 18], reductions in stimulant use were accompanied by reductions in severity of psychiatric symptoms as measured by the ASI.

There were only relatively small numbers of studies examining interventions for methamphetamine users. Those that have been conducted have shown good outcomes, with CBT (with and without MI) and CM all showing some evidence of efficacy. CM in particular appears to be a powerful intervention. One of the difficulties with a review of this type is comparing interventions that are labelled as CM, CBT or MI. Many of the studies had only a brief description of the therapy that was undertaken, but many had fidelity checks

built in to their methods. In general, however, it appears that this broad approach to treatment of amphetamine dependence is useful.

Significant further study is required to expand the range of treatment options for methamphetamine users (including treatments from other theoretical orientations), although the studies undertaken so far demonstrate that, contrary to some clinical beliefs, there are effective interventions available for methamphetamine users that should be established as routine practice.

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Table 1

Original citations extracted

Term/Source	Total citations	Limited to methamphetamine
Cognitive Behavior(u)al Therapy, cognitive therapy, behavior(u)r therapy, schema therapy, acceptance and commitment therapy/Medline	25459	8
Cognitive Behavior(u)al Therapy, cognitive therapy, behavior(u)r therapy, schema therapy, acceptance and commitment therapy /PsycINFO	70031	54
Contingency Management, Behavior(u)r Modification /Medline	511	9
Contingency Management, Behavior(u)r Modification /PsycINFO	12204	19
Motivational Incentives /Medline		
Motivational Incentives / PsycINFO	31	0
Dialectical Behavior(u)r Therapy /Medline		
Dialectical Behavior(u)r Therapy /PsycINFO	1065	2
Mindfulness /Medline		
Mindfulness /PsycINFO	367	0
Node Link Mapping /Medline		
Node Link Mapping /PsycINFO	70	1

Table 2

Summary of randomised trials (alphabetical order)

Study	Participants	Methods	Intervention	Main outcomes	Comments
Baker et al., 2001 [13]	N=64; Regular amphetamine users (at least 4 times a month)	Single blind randomised trial. Pre-treatment assessment prior to randomisation, post treatment assessment conducted by independent non-treating assessor.	2 and 4 session relapse prevention versus self help control	Significant reduction in amphetamine use overall with no differences between groups. Significant increase in abstinence in treatment group at 6 months.	Analysis not ITT
Baker et al., 2005 [14]	N=214; Regular amphetamine users (at least 4 times a month)	Single blind randomised trial. Pre-treatment assessment prior to randomisation, post treatment assessment conducted by independent non-treating assessor.	2 and 4 session motivational interviewing plus relapse prevention versus self help control	Overall significant reduction in amphetamine use, significant increase in abstinence in the two treatment groups, significant decrease in depression in the 4 session group but differences lost at 6 month follow-up.	ITT and treatment received analyses, author's conclusions based on treatment received analysis.
Jaffe et al., 2007 [25]	N=162 gay and bisexual methamphetamine users. Only included those who completed 4 weeks of intervention (N=145).	RCT, um randomisation with ethnicity and level of use as factors. Allocation concealment and blinding not reported.	CBT versus CM versus CBT+CM versus gay-specific CBT.	Examined whether methamphetamine use predicted rates of depression and risky sexual practices using latent growth curve models. Gay-specific CBT group showed a more rapidly decreasing rate of methamphetamine use. Reducing methamphetamine use was associated with reduction in depression and sexual risk - taking.	Same dataset as Shopiaw et al. 2005 and Peck et al 2007.
Peck et al., 2005 [24]	N=162 out of 263 gay and bisexual methamphetamine users that began a 2 week baseline period.	RCT, um randomisation with ethnicity and level of use as factors. Allocation concealment and blinding not clear.	CBT versus CM versus CBT+CM versus gay-specific CBT.	Significant decreases in methamphetamine use and depression across all groups. Combination of CBT and CM increased attendance at CBT.	No ITT analysis reported. Same dataset as Shopiaw et al., 2005 and Jaffe et al., 2007
Peirce et al., 2006 [19]	N=388 stimulant abuse enrolled in methadone maintenance.	RCT, blinding not clear at post treatment assessment. Research staff were aware of individual group assignment after randomisation but not randomisation sequence.	12 week usual care versus 12 week usual care plus abstinence incentives.	Incentive group produced significantly more stimulant and alcohol free samples; effect lost at 6 months. Incentive group more likely to achieve continuous abstinence.	Not methamphetamine specific, no ITT analysis.
Petry et al., 2005 [20]	N=415 (455 randomised); Cocaine or methamphetamine abuse and dependence	Single blind randomised trial. Randomisation post initial assessment. Research staff were aware of individual group assignment post randomisation but not randomisation sequence.	Abstinence incentive (contingency management) plus usual care versus usual care only (counselling)	Significant increase in treatment retention in CM group; CM group produced significantly more stimulant free urines; significantly higher rates of continuous abstinence (4, 8 and 12 weeks)	ITT analysis; 40 randomised but ineligible excluded; no loss to follow-up from N=415; combined analysis of cocaine and MA dependent users

Study	Participants	Methods	Intervention	Main outcomes	Comments
Rawson et al., 2004 [15]	N=978; Methamphetamine dependence	Multisite single blind randomised trial.	Matrix model (16 week multicomponent incl group CBT, group family education, group social support, individual counselling, weekly urine testing) versus treatment as usual.	Results were analysed by site. Both groups improved significantly from baseline to post treatment and 6 month follow-up. At most sites Matrix treatment resulted in increased attendance, more drug free urine samples and longer periods of abstinence during treatment. Effect was lost at follow-up.	Treatment as usual differed at each site of this multisite study.
Rawson et al., 2006 [18]	N=177; Cocaine (N=160) and methamphetamine dependence (N=17)	RCT. Blinding and allocation concealment not reported.	Contingency management versus cognitive behavioural therapy versus combined CM/CBT	Significantly increased treatment retention and treatment completion in CM and CM/CBT group compared to CBT only; significantly higher number of stimulant free samples and rates of abstinence of 3 weeks or more in CM and CM/CBT conditions compared to CBT only; all groups significantly decreased use; no differences at followup on stimulant free urines	ITT analysis not stated but authors subsequently confirmed ITT analysis completed; >18% loss to follow-up; analyses on combined cocaine and MA dependent participants
Roll et al., 2006 [29]	N=113 methamphetamine use or dependence	Randomised controlled trial stratified by amphetamine abstinence (by urine) at entry and cannabis and opiate abstinence (by urine) at entry. Blinding and allocation concealment not stated.	12 weeks of treatment as usual versus 12 weeks of contingency management	No difference in treatment retention. Increase in negative urine samples and length of abstinence in CM group.	Treatment as usual not consistent across 3 sites. No ITT analysis reported. Missing data coded as negative if proceeding and preceding samples and otherwise positive or missing.
Shoptaw et al., 2005 [23]	N=162 methamphetamine dependent gay/bisexual men.	Randomised trial	156 weeks of standard CBT versus 16 weeks of CBT+CM versus 16 weeks of culturally tailored CBT	Increased treatment retention, longest period of consecutive methamphetamine-negative urine test, treatment effectiveness score and fewer missed urine screens in the groups that included CM (CM only and CBT+CM). Those in the CBT+ CM group earned significantly more incentive payouts than those in the CM only group and attended significantly more sessions that those in the CBT only group.	Same data as Jaffe et al 2007 and Peek et al 2005. No ITT analysis reported.
Shoptaw et al., 2006 [30]	N=229 methamphetamine abuse or dependence	Single blind urn randomised trial; allocation concealment not stated	Sertraline only versus sertraline plus CM versus placebo plus CM versus placebo only	No main effects for sertraline or CM; Significantly fewer in the sertraline only group achieved 3 weeks of continuous abstinence, fewer retained in treatment and attended fewer relapse prevention groups; no differences between groups on craving or depression.	No ITT analysis reported but authors subsequently confirmed ITT analysis undertaken.
Yen et al., 2004 [16]	N=154; methamphetamine (N=67) and heroin users (N=78).	Randomised trial; blinding and allocation concealment not stated	Five sessions of motivational interviewing plus relapse prevention versus (unstated) control	Significant increase in self efficacy in intervention group	ITT analysis not stated