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Evidence Check

The effects of online brief interventions for the prevention and treatment of methamphetamine use

An **Evidence Check** rapid review brokered by the Sax Institute for the Centre for Population Health in the New South Wales (NSW) Ministry of Health. August 2015.

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This report was prepared by:

David R Skvarc, Jay Varcoe, Bosco Rowland, Matthew Fuller-Tyszkiewicz, David Austin, John W Toumbourou.

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The effects of online brief interventions for the prevention and treatment of methamphetamine use: a systematic review

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Abbreviations list

ANZCTR	Australia New Zealand Clinical Trial Registry
AREAS	Academic Role Expectations and Alcohol Scale
BI	Brief Intervention
BMI	Brief Motivational Intervention
BRSE	Benzodiazepine Refusal Self Efficacy
BT	Brief Treatment
BWSQ	Benzodiazepine Withdrawal Symptom Questionnaire
CBT	Cognitive Behavioural Therapy
DASS	Depression, Anxiety and Stress Scales
ES	Effective Size
GAS	Girls and Stress
KCM	Keep a Clear Mind
LDQ	Leeds Dependence Questionnaire
MAP	Maudsley Addiction Profile
MET	Motivational Education Therapy
NHMRC	National Health and Medical Research Council
NSW	New South Wales
OTI	Opiate Treatment Index
PDSS-SR	Panic Disorder Severity Scale – Self-Report
QoL	Quality of Life
SDS	Severity of Dependence Scale
SPIN	Social Phobia Inventory
SR	Self-Report
ST	Specialised Treatment
URICA	University of Rhode Island Change Assessment
WHODAS-II	World Health Organisation Disability Assessment Scale-II

1 Executive summary

Background

Methamphetamine (N-methyl-alpha-methylphenethylamine) is a central nervous stimulant increasingly used as an illegal recreational drug in Australia and other nations. Methamphetamine and its crystalline form ("ice") are associated with dependency, amphetamine psychosis, and other significant potential harms. In Australia, people aged less than 30 years have the highest rates of use.

About this document

This rapid literature review was completed by a Deakin University consultancy team as a Sax Institute "evidence check" commissioned by the Centre for Population Health in the New South Wales (NSW) Ministry of Health. The aim was to examine the evidence regarding the effectiveness of online brief interventions (BIs) to reduce youth methamphetamine use. The primary outcome of this review was to examine the evidence that fulfilled three criteria: (1) youth focused; (2) amphetamine prevention or treatment focused; and (3) used web or computer-based BIs. Literature that did not fulfil all three criteria but was deemed relevant by the research team was included as part of a secondary analysis.

How this document was produced

Members of the research team conducted a systematic search of three large electronic databases to capture and review as much relevant information as possible. Three experts in the field of addiction science were also consulted to suggest additional resources that may have been missed. 374 non-duplicate citations were manually screened for relevance, and from these, 18 articles were included after a full-text screen.

Primary outcome results (3 criteria met)

Evidence from four randomised control trials and one non-experimental trial (Table 1) suggested that the use of computerised BIs can produce healthy effects on attitudes and intentions associated with methamphetamine use. However, the two trials that examined behavioural outcomes found small effect sizes (g = 0.09 [approximating to 0.09 of a standard deviation reduction]; n = 696) that may be relevant to longer-term reductions in methamphetamine use. Promisingly, the pooled results of included studies suggests that the use of brief online interventions can have moderate to large impacts in reducing both intent to use methamphetamine (g = 0.58, n = 109) and favourable attitudes towards future use (g = 0.98, n = 207).

Secondary outcome results (<3 criteria met)

Two randomised trials were identified (Table 2) that evaluated the efficacy of brief treatment interventions for impacts on amphetamine-type stimulant use amongst youth. Overall these studies reported non-significant and weak effects. Marsden, et al. (2006)[26] found no intervention differences while Srisurapanont, Sombatmai & Boripuntakul (2007)[34] found a small reduction in fewer days of use.

Findings in relation to three questions in the consultant brief

Q1. What youth-focused online brief interventions for amphetamine-type stimulants, particularly Crystalline Methamphetamine, are described in the literature?

ANSWER 1: Five papers reported evaluations of online BIs for youth targeting the prevention of amphetamine-type stimulant use (see Table 1). A search using broader criteria (Table 2) revealed two studies

that evaluated the efficacy of brief treatment interventions for impacts on amphetamine-type stimulant use and reported non-significant and weak effects. Marsden, et al. (2006)[26] found no intervention differences while Srisurapanont, Sombatmai & Boripuntakul (2007)[34] found a small reduction in fewer days of use. Tait, et al. (2012)[16] have published a protocol to trial the efficacy of brief online interventions for the treatment of amphetamine-type stimulant use in adults.

Q2. What recruitment strategies, screening strategies, mode of delivery and intervention content are employed in the identified BIs?

ANSWER 2: In the preventative interventions (Table 1) recruitment strategies have included: all students completing interventions as part of their school curricula; recruitment through community organisations; online; and in a museum. Screening strategies are not used in preventative interventions as these are delivered universally across the target population. The intervention content has focused: on life skills; problem solving; and drug education. The brief treatment interventions targeting substance users in Table 2 generally screened and referred in treatment sites or via youth agencies. Intervention content included: motivational interviewing; and change strategies and referrals.

Q3. What evidence is there for the effectiveness of the BIs?

ANSWER 3: There is promising but inconclusive evidence that online BIs may play a role in preventing school-aged youth populations from initiating illicit drug use including amphetamine-type stimulant use. There have been no trials of online BI to treat youth methamphetamine use. Of the two trials of BI to treat youth methamphetamine use results are not promising. The largest trial showed no effect[26] and the smaller trial of volunteer students only a small reduction in days of use.[34]

Recommendations

Given a diverse range of research with some promising findings across the five preventative trials to date (Table 1), further implementation and evaluation of online BIs to *prevent* youth amphetamine-type and other substance use appears warranted. As the two trials of BIs for the *treatment* of youth methamphetamine use (Table 2) have not shown overall benefits, further investment in this area needs to be carefully justified. It is recommended that the proposed Tait, et al. (2012)[16] Australian treatment trial with adults be monitored.

2 Abstract

This paper presents the findings of a systematic literature review of online BIs to prevent and or reduce crystalline methamphetamine use amongst young people aged 15 to 25 years. Based on a search of peer-refereed papers that were designed to evaluate relevant interventions, a total of 374 non-duplicate citations were screened and 26 articles were retrieved and appraised, and an additional three were recommended by subject-matter experts. Of these, 12 were excluded for specified reasons leaving 18 papers that were deemed to fall within the broad scope of the current review. Five of these papers met all three criteria concerning (1) Young people; (2) Amphetamines; and (3) computer-based BIs. These five included papers were focused on prevention, four utilised randomised trial and one a quasi-experimental design. One was an Australian study. All five studies measured positive reductions in one or more targeted risk factors (e.g. knowledge of harms, intentions to use methamphetamines), and two randomised trials measured reductions in methamphetamine use. Overall, the findings are deemed promising but inconclusive. Further implementation and evaluation of online BIs to prevent and treat youth methamphetamine use is warranted. Thirteen additional papers deemed highly relevant were similarly analysed to provide a broader scope and two reported an evaluation of BIs as treatment for youth methamphetamine use but did not show overall benefits. Studies were included initially if they focused on youth or young adults, methamphetamine and online intervention. Due to the scarcity of relevant literature, a secondary analysis examined the expanded criteria of methamphetamine use and computerised interventions. Potentially relevant Australian trials were identified in the planning stage. As the benefits of online BIs to prevent and treat youth methamphetamine use are unknown, it is recommended that the proposed Tait, et al. (2012)[16] trial with adults be monitored.

3 Introduction

Methamphetamine (N-methyl-alpha-methylphenethylamine) is a central nervous system stimulant that is used increasingly as an illegal recreational drug in Australia and in other nations. The use of methamphetamine and its crystalline form, "ice", are associated with dependency and potentially harmful effects such as amphetamine psychosis, aggressive behaviour, and other significant potential harms.[7] In the working population, rates of use have been estimated at approximately 6.4% amongst Australians aged between 12-17, and 11.2% between the ages of 18 and 29, before sharply decreasing. Industry trends also reveal that workers within the hospitality, construction, retail, and transport sectors contain some of the highest proportions of users, (9.5%, 5.4%, 4.6% and 5.4% respectively).[15]

Treatment and prevention of methamphetamine addiction is difficult and limited evidence exists to confirm the efficacy of pharmaceutical or psychosocial treatments. Best practice for methamphetamine addiction treatment and prevention appears to be a combination of substitution psychopharmacology and symptom management, coupled with psychosocial management strategies.[14] Typically, patients may be prescribed antipsychotic medication to manage acute amphetamine psychosis, in combination with additional antidepressants and antianxiety medication to help manage withdrawal symptoms. In Australia, detoxification treatment through entry into residential facilities has been shown to be effective in reducing methamphetamine use in the short term (within three months after exiting the facility), but use typically returns to pre-treatment level within three years.[11] This suggests that a combination of treatment and prevention strategies may be most effective when coupled with long-term psychosocial strategies for maintaining abstinence.

Evidence suggests that exposure to information about the risks of methamphetamine use (amongst other substances) through public health message dissemination through the media can have population level effects in reducing the amount of methamphetamine used.[8] Provision of information to users (and pre-users) about risks, associated harms, and correction of erroneous beliefs – particularly inflated estimates of use amongst peers and the broader community and underestimated risks of health affects – may also be effective. Brief interventions (BIs); typically short, motivation-based interviews; can encompass this level of information provision and provide a personalised response to substance use. BI management strategies typically follow the *FRAMES* framework (Feedback, Responsibility, Advice, Menu of strategies, Empathy, and Self-Efficacy).[2] By encouraging users to take ownership of their use, BI aims to motivate users to examine their own motivations for use and compare these with motivations for abstinence.

Strong evidence suggests that the employment of BI is effective for the treatment of a broad range of mental health and substance use conditions associated with alcohol[12]; cannabis[3]; and smoking.[10] The short nature of the BI also lends itself well to multiple avenues of service delivery, including computerised versions, as examined in the review into computer-based interventions for weight-loss and obesity.[17] Given the considerable evidence of efficacy for BI and the near-ubiquitous availability of internet-capable technology amongst younger Australians, an enormous opportunity exists for computerised interventions aimed at improving a range of health outcomes across a range of ages and demographics.[6]

The present paper aimed to examine online BIs for the prevention and treatment of crystalline methamphetamine use; particularly in the Australian context. The target population evaluated for the present report were individuals between the ages of 15 and 25 deemed to be currently or potentially at risk of using crystalline methamphetamine. The focus in what follows was on computerised BIs, however, other

BIs and media strategies were also considered where relevant to the prevention of crystalline methamphetamine use. Papers identified in the main search were also examined to inform knowledge of BIs for the treatment of methamphetamine use.

4 Method

The search was undertaken by a Deakin University consultancy team on behalf of the Sax Institute for the Centre for Population Health in the NSW Ministry of Health to assist in assessing feasibility for the development of a computerised pilot program for crystalline methamphetamine users between the ages of 15 and 25. The project was commissioned as an "evidence check" and designed as a rapid review of existing evidence.

A protocol for the search was agreed upon by the authors and commissioning agent, based on the PRISMA guidelines.[13] We searched the EMBASE, PSYCHINFO and MEDLINE for relevant articles. We used the search terms listed in the Appendices to locate relevant material. Included articles were evaluated according to the National Health and Medical Research Council (NHMRC) guidelines for the hierarchy of evidence.[5]

Types of studies

This review focused on those peer-reviewed studies that assessed the prevention and treatment of methamphetamine use through a computerised brief intervention. The authors included trials that involved a form of brief intervention, the treatment or prevention of a substance use problem amongst young people, and that were computerised. The studies were also restricted to those that were in English and completed within the last 15 years. Finally, the authors provided a rating of the quality and strength of research findings in the included studies to evaluate the methodological quality.

Types of participant

Studies and reviews involving young people were the focus of this review, and the authors selected an approximate age range of 15-25 years. There were no sociocultural exclusion criteria.

Types of intervention

The target intervention for this review was online web-based BIs. These include; information, advice, support, counselling, and referral and applied cognitive behavioural therapy techniques, motivation therapy or other psychotherapeutic treatments. No search constraint was placed on the length or frequency of the brief intervention. BIs addressing amphetamine-type stimulant, particularly crystalline methamphetamine, use were the primary area of interest. We also commented on some studies that contained a form of brief intervention for other substance abuse and youth mental health.

Assessment of included studies

The present report assessed the following: intervention completion/retention rates, primary and secondary outcomes, sample-size, methods used for evaluation (including any validated tools), exclusion criteria, and ranking of the quality of the evidence using the NHMRC hierarchy of evidence (or other appropriate scale). The primary outcomes in this report include amphetamine-type stimulant use at specified follow-up periods, such as assessment of reduction in frequency and amount of use or lapse or relapse. The secondary outcomes assessed by the authors included whether the individuals display health-seeking behaviour, such as voluntary admission to a drug and alcohol service/appointment with a GP and quality of life (QoL) measures such as improved relationships and general functioning. For prevention studies we examined risk factors such as intentions to use.

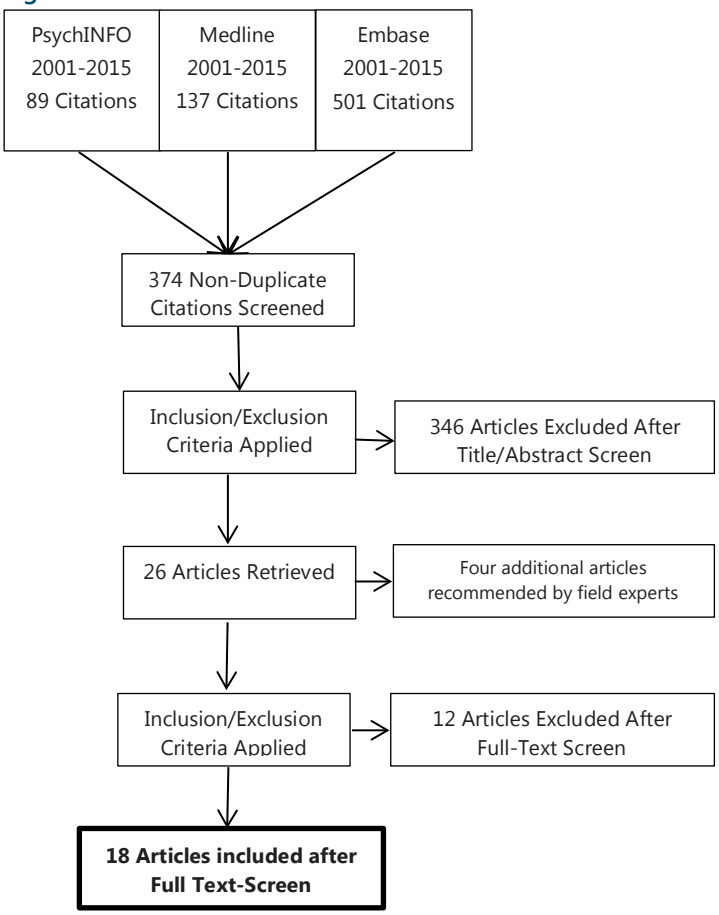
Electronic Searches

Methods of the search were documented and agreed in advance in a project proposal. A systematic search of the evidence using the PSYCHINFO (2001-present), MEDLINE (2001-present) and EMBASE (2001-present) databases was conducted. The selected search terms used for each database can be viewed in the attached appendices. To consider other studies including those not reported in peer-refereed papers (the grey literature) three experts were consulted. Time limitations precluded extensive searching for grey literature.

Data was extracted through the authors selecting trials that related to substance use, BIs, and computer- or web-based technology. We developed a data extraction protocol based on the Cochrane Consumers and Communication Review Group's data extraction template, pilot-tested it on five randomly-selected included studies, and refined it accordingly. One review author extracted the data from included studies and the second author checked the extracted data. Then, any disagreements were resolved by discussion between the two review authors; any disagreements were resolved by a third author.

Articles that contained information relating to computer-based BIs but not substance use were included as part of an additional secondary analysis. We used a combination of search terms in order to access relevant material. We only included those studies that were published in English and which were published from 2001 to the present. Detailed search terms are provided in the appendices.

Figure 1 - PRISMA Flow Chart



Based on the search criteria a total of 374 non-duplicate citations were screened and 28 articles were retrieved and appraised. Of these 23 were excluded for the specified reasons listed in the Appendices. A total of five papers were assessed to fall within the scope of the current review (Table 1 below). The evaluation design of the included articles was evaluated using the NHMRC evidence rating.

Table 1: Five papers that met all three criteria

Author date	Intervention	Evaluation	Outcomes	Effects	NHMRC evidence rating
Schinke, Di Noia, & Glassman (2004)[30]	1. Computer-delivered interactive 20 minute Brief Intervention (n = 64); 2. Professional and peer-guided interactive Brief Intervention program (n = 65); versus 3. No intervention control (n = 60)	189 youth randomised by trial site to three conditions, mean age 9.6 years (*SD* = 1.2)	Four item Likert scale measuring attitudes towards non-alcohol, non-tobacco drug use, before and immediately after intervention	Reduction in positive perceptions towards drugs use in others ($p < .05$; "People who use drugs are cool" Effect Size [ES] = 1.84); Reduction in acceptance of drug offers ($p < .025$). Reduction in plans to use drugs (ES = 0.98, not significant)	**II**, randomised control trial (cluster randomised by community site)
Schinke & Schwinn (2005)[31]	1. Computer-based "Girls and Stress" (GAS) CD-ROM 20 minute stress management Brief Intervention; versus 2. 40-minute teacher-delivered "Keep a Clear Mind" (KCM) curricula (controls)	47 participants received GAS Intervention, 44 KCM (controls). All participants were year seven girls. Intervention was randomised by school site	Centre for Disease Control Youth Risk Behaviour Survey; American Drug and Alcohol Survey. Pre-intervention and two weeks after	At the follow-up, the intervention group was significantly less likely to view alcohol, tobacco, or drugs as a "good way to handle stress" (ES drugs = 0.57). Less likely to plan to use alcohol, tobacco, marijuana or illicit drugs (ES drugs 0.34)	**II**, randomised control trial (cluster randomised by school)
Schwinn, Schinke, & Di Noia (2010)[32]	12-session web-based life skills intervention; versus no intervention controls	236 girls aged 13-15, randomly assigned to either intervention or control	Centre for Disease Control Youth Risk Behaviour Survey; pre-intervention, six weeks follow-up, and six months follow-up	At six weeks, groups did not differ significantly on substance use items. However, at six months the intervention group was significantly less likely to engage in substance use, including methamphetamine ($p < .05$; ES = 0.28)	**II**, randomised control trial (individuals randomised to condition)

Author date	Intervention	Evaluation	Outcomes	Effects	NHMRC evidence rating
Cheng & Anetta (2012)[19]	Computer-based (Serious Educational Game) autostereoscopic 3D display technology Brief Intervention	98 students from grades 6-8. All participants received the intervention offered in the museum in Changhua City, Taiwan	Semi-structured interviews; attitude questionnaire. Pre-test/post-test design	Significant improvement in post-test understanding of the effects of methamphetamine on the brain ($p < .001$, ES $d = 0.71$); significant reduction in favourable attitudes towards methamphetamine use ($p < .05$)	**III-3**, comparative study without concurrent controls
Vogl, Newton, Champion & Teesson (2014)[35]	Six 40-minute lessons that included a 20-minute teacher led classroom component and a 20-minute computer intervention; versus usual practice health classes (controls)	1734 students n = 906 Climate Schools intervention; n = 828 control	Self-report questionnaire at baseline, post-intervention and 10-month follow-up	Immediately post-intervention there was a significant difference between the intervention and control groups (F (1, 1200) = 5.96, p = 0.01). The frequency of methamphetamine use decreased for intervention students (8% to 6%) and increased for controls (12% to 13%) (ES = 0.04). At both five months and 10 months post-intervention, there were no significant differences between the groups in their frequency of methamphetamine use	**II**, randomised controlled trial (cluster randomised by school)

ES = Effect Size based on mean difference divided by pooled standard deviation

Of the five included papers in Table 1 four utilised randomised trial and one a quasi-experimental design. One of the five studies was completed in Australia.[35] All five studies measured positive reductions in one or more targeted risk factors (e.g. knowledge of harms, intentions to use methamphetamines). Two randomised trials measured reductions in methamphetamine use.[35,32]

The overall findings from the five included studies were evaluated using the NHMRC hierarchy of evidence matrix.[5] The evaluations using this matrix are presented below.

Overall evaluation of the five included studies in Table 1 based on the NHMRC Hierarchy of Evidence Matrix

Component	Rating	Description
1. Evidence base	**A**	One or two Level II studies with a low-risk of bias or Self-Report /several Level III studies with a low-risk of bias

Component	Rating	Description
2. Consistency	**C**	Some inconsistency, reflecting genuine uncertainty around question. Substantial levels of statistical heterogeneity across studies detected in meta-analysis
3. Clinical impact	**C**	Moderate
4. Generalisability	**B**	Evidence directly generalisable to target population with some caveats
5. Applicability	**A**	Evidence directly applicable to Australian healthcare context

The analysis based on the NHMRC Hierarchy of Evidence Matrix suggested the overall findings from the five included studies were promising but not comprehensive. The overall evidence was judged to be inconsistent due to the diversity of designs and moderate clinical relevance due to the focus on prevention.

A further nine studies were identified that met two of the three search criteria. These are presented in Table 2 below.

Table 2: Nine papers that met two of the three criteria

Author date	Intervention	Criteria	Evaluation	Outcomes	Effects	NHMRC evidence rating
Huang, Tang, Lin & Yen (2011)[20]	Motivational Education Therapy (MET); education-only control	A, B	94 methamphetamine or ecstasy using adolescents randomly allocated to either MET (n = 46) or control (n = 48)	University of Rhode Island Change Assessment (URICA)	At post-test, the MET group reported significantly higher readiness to change compared with the control group ($p < .05$); and significantly higher rates of contemplation compared to controls ($p < .01$). No changes were observed for the pre-contemplation, maintenance, or action subscales	**II**, randomised control trial

Author date	Intervention	Criteria	Evaluation	Outcomes	Effects	NHMRC evidence rating
Kirkpatrick, Manoukian, Dear & Johnston (2013)[21]	Six- lesson therapist-assisted Internet delivered CBT program	B, C	All 10 participants completed the course within the eight weeks. Post-treatment and two month follow-up questionnaires were completed by all participants	Treatment accessibility was assessed at post treatment via four questions, using a Likert scale; GAD-7, PHQ-9, K-10, and SDS	Compared to the baseline assessment, significant improvements were observed after follow-up for the GAD-7, PHQ-9, K-10, and SDS ($p < .05$) After treatment and follow-up, 9/10 participants met the criteria for significant recovery as defined by the GAD-7	**III-3**, comparative study without concurrent controls
Kypri, Langley, Saunders, Cashell-Smith & Hernison (2008)[22]	Single session BI; Multiple sessions BI; control group	A, C	429 participants randomly allocated to either control (n = 146); single-BI (n = 138), or multi-BI (n = 145)	AUDIT; Academic Role Expectations and Alcohol Scale (AREAS)	Compared with controls, participants within the single-BI group reported significantly lower total consumption at both six and 12 months ($p < .05$); fewer consequences at six ($p < .005$) and 12 months ($p < .05$); and overall lower AUDIT score at 12 months ($p < .001$). Compared with controls, the multi-BI group reported significantly lower occasion and overall consumption at six months ($p < .05$); lower frequency of heavy drinking at six months ($p < .05$); fewer academic consequences at six and 12 months ($p < .05$); and lower AUDIT scores ($p < .001$)	**II**, randomised control trial

Author date	Intervention	Criteria	Evaluation	Outcomes	Effects	NHMRC evidence rating
Kypri, et al. (2012)[23]	Web-based Brief Intervention; screening-only control	A, C	1789 participants randomly allocated to either screening-only control (n = 850) or BI (n = 939)	AUDIT; AREAS	Relative to controls, at five months post-intervention participants within the BI group reported significantly lower frequency of drinking ($p < .05$); significantly lower volume of alcohol consumed ($p < .05$); significantly fewer academic problems ($p < .05$); and significantly lower odds of engaging in heavy drinking ($p < .001$). There was no difference between groups for odds of binge drinking or typical occasion quantity	**II**, randomised control trial
Kypri, et al. (2014)[24]	Web-based BI; control	A, C	3422 heavy drinkers were randomised to either BI (n = 1706) or control (n = 1716) groups	AUDIT; Leeds Dependence Questionnaire (LDQ); AREAS	Preliminary analyses suggested that the BI group drank significantly fewer drinks per session compared to controls at the six month follow-up ($p < .01$), but this did not survive adjustment for attrition. All other outcomes (drinking duration, volume consumed, academic consequences, and risks for binge or heavy drinking) did not significantly differ between treatment groups	**II**, randomised control trial
Madras, et al. (2009)[25]	Screening and BI, randomly selected and assigned by severity to either BI, Brief Treatment (BT), or Specialised Treatment (ST), baseline and six months follow-up	A, B	Mean age of 45 years, 459,599 patients screened. Specific subset of Participants aged 25 years or less who used methamphetamine (n = 118)	User reported rates of use	Significant rates of abstinence from methamphetamine use after any kind of intervention; 82 participants reported ceasing methamphetamine use completely at six months ($p < .001$). There were reductions in use observed at outcome but the analyses do not inform treatment efficacy.	**III-3**, comparative study without concurrent controls

Author date	Intervention	Criteria	Evaluation	Outcomes	Effects	NHMRC evidence rating
Marsden, et al. (2006)[26]	Brief Motivational Intervention (BMI); information-only control	A, B	299 non-injecting stimulant users (including 265 amphetamine users) randomly allocated to either BMI (n = 145) or control (n = 154)	Maudsley Addiction Profile (MAP), Severity of Dependence Scale (SDS)	Both BMI and control groups reported significant improvements in substance use outcomes at a six-month follow-up compared to baseline, but no group was superior. Past 90-day use of ecstasy and cocaine and the quantity of ecstasy, and crack was significantly reduced at six months for both groups (all $p < .001$). Cocaine use in gram also fell significantly ($p < .05$)	**II**, randomised control trial
Palfai, et al. (2014)[28]	Web-based BI; control	A, C	123 participants randomly allocated to either BI or control groups	Past 90 day marijuana use; negative consequences; ASSIST; Readiness-to-change; Perception of norms	No significant differences between groups for majority of outcomes. Significant reduction in perceptions of peer usage ($p < .05$) but not individual readiness-to-change, nor other variables	**II**, randomised control trial
Srisurapanont, Sombatmai & Boripuntakul (2007)[34]	BI; or education-only control	A, B	48 methamphetamine users randomly allocated to either BI (n = 24) or control (n = 24)	Days using per week; number of tablets used; urinalysis; reported abstinence	At week eight the BI group reported significantly fewer days using per week compared to controls ($p < .05$); though no other significant differences compared to controls was observed	**II**, randomised control trial

Criteria legend: A = youth-focused; B = addressing amphetamines; C = online/computer intervention.

Table 2 included two randomised trials that evaluated the efficacy of brief treatment interventions for impacts on amphetamine-type stimulant use amongst youth. Marsden, et al. (2006)[26] found no intervention differences while Srisurapanont, Sombatmai & Boripuntakul (2007)[34] found a small reduction in fewer days of use. The studies in Table 2 demonstrated a range of BIs have had some positive impacts on varied forms of substance use.

A further four studies (Table 3) were identified in the search that were considered of potential interest to at least one criteria. These are presented below in Table 3.

Table 3: Four papers that met at least one of the three criteria

Author date	Intervention	Criteria	Evaluation	Outcomes	Effects	NHMRC evidence rating
Baker, Boggs & Lewin (2001)[18]	Brief (two-sessions or four-sessions) of cognitive behavioural interventions for adults that were regular amphetamine users	B	Compared a control group that received a self-help book (n = 32) to groups randomised to two-sessions or four-sessions of cognitive behavioural intervention (n = 32)	Outcomes were assessed based on changes on the Opiate Treatment Index (OTI) and six months of abstinence from amphetamine use	Those randomised to the BIs made larger improvements on the OTI (effect size 0.93) and had a greater percentage abstinent post-intervention (58.3%) compared to the control group (0.40 and 21.4%). Improvements were not clearly associated with the number of sessions attended (Table 2)	**II**, randomised control trial
Newby, Mewton, Williams & Andrews (2014)[27]	Internet-delivered CBT (iCBT) course	C	Using an open-trial design the researchers investigated adherence to and effectiveness of a six-lesson therapist-assisted iCBT program from anxiety and depression for patients (N=707) Who completed the program under the supervision of primary care clinicians	Patients completed the Kessler Distress Scale -10 (K-10), Patient Health Questionnaire-9 (PHQ-9), General Anxiety Disorder Scale-7 (GAD-7), Mini Social Phobia Inventory (SPIN), Panic Disorder Severity Scale – Self Report (PDSS-SR), and the World Health Organisation Disability Assessment Scale-II (WHODAS-II) prior to commencing lesson 1, and at follow-up	In comparison with baseline results, at the follow-up point participants recorded significantly improved scores on the GAD-7;PHQ-9; SPIN; PDSS; K-10; WHODAS-II; and PHQ-9 Suicidal Ideation (all p <.001)	**III-2**, comparative retrospective cohort study with concurrent controls

Author date	Intervention	Criteria	Evaluation	Outcomes	Effects	NHMRC evidence rating
Parr, Kavanagh, Young & Mitchell (2011)[29]	A pilot study of online assessments	C	Participants n=21 (33% male and 66% female) completed assessment at Three months and 14 (38% male, 44% female) completed the study at six months. They completed online assessments and accessed newsletters on managing withdrawal symptoms and developing alternate ways to cope with life events. Therapist assistance was provided by email. Follow-up was at three and six months	Benzodiazepine Refusal Self Efficacy (BRSE); Benzodiazepine Withdrawal Symptom Questionnaire (BWSQ); Depression, Anxiety and Stress Scales (DASS); SDS	Compared with baseline, participants reported a significant improvement to total doses taken, SDS, and BRSE at three months ($p<.05$). Compared with baseline, participants reported significant improvements to total doses, SDS, BRSE, and DASS (depression) at 6 months ($p<.05$). At three months, 14 of 21 remaining participants reported a reduction in use. At six months, 12 out of 14 participants reported similarly	**IV**, uncontrolled case series

Author date	Intervention	Criteria	Evaluation	Outcomes	Effects	NHMRC evidence rating
Smout, et al. (2010)[33]	Single-session check-up intervention	B	Participants (n=80) 39% female, 61% male, Mean age 29 years who used a psychostimulant in the past month and were not intoxicated or otherwise incapable	Participants completed a readiness to change questionnaire, general substance use reported self-reporting	Compared with baseline values, at three months participants reported significant reductions to the number of days using methamphetamine in the past month; number of occasions using methamphetamine; length of longest methamphetamine binge (all p <.001); MDMA past-month use; methamphetamine-related consequences; and fewer were using injection to use methamphetamine (all p <.05). No changes were noted in the number of MDMA used in the past month, presentations to health services, or readiness to change	**IV**, uncontrolled case series

Criteria legend: A = youth-focused; B = addressing amphetamines; C = online/computer intervention

Table 3 presents a further four studies that were identified in the search and found to be relevant to at least one criteria. The study by Baker, Boggs & Lewin (2001)[18] found that amongst adult regular amphetamine users random assignment to BIs (between one to four sessions of cognitive behavioural treatment) was associated with larger reductions in amphetamine use relative to controls (OTI effect size difference 0.53). The study by Smout et al. (2010)[33] found that in an adult sample of stimulant users, exposure to a single-session intervention was associated with reductions in the frequency of methamphetamine use. Two studies present preliminary evidence that online BIs may be of assistance in treating anxiety and depression[27] and in assisting patients to use Benzodiazepines in accord with guidelines.[29]

5 Discussion

This paper presents the findings of a systematic literature review of online BIs to treat and prevent crystalline methamphetamine use amongst young people aged 15 to 25 years. Five trials were identified that met all inclusion criteria and these reported the implementation and evaluation of online BIs to prevent and treat youth amphetamine-type and other substance use. In general the findings of these trials appeared promising in reducing favourable attitudes and intentions, and there were also small effects in reducing use (Table 1). The two trials of BIs for the treatment of youth methamphetamine use did not show overall benefits (Table 2).

Findings in relation to three questions in the consultant brief

Q1. What youth focused online BIs for amphetamine-type stimulants, particularly Crystalline Methamphetamine, are described in the literature?

ANSWER 1: Five papers report evaluations of online BIs for youth targeting amphetamine-type stimulants. All focused on prevention in school age populations (See Table 1). These generally showed promising results, but there was heterogeneity in designs and hence insufficient research to be conclusive. A search using broader criteria (Table 2) revealed two studies that evaluated the efficacy of brief treatment interventions for impacts on amphetamine-type stimulant use and reported non-significant and weak effects. Marsden, et al. (2006)[26] found no intervention differences while Srisurapanont, Sombatmai & Boripuntakul (2007)[34] found a small reduction in fewer days of use. Tait, et al. (2012)[16] have published a protocol to trial the efficacy of brief online interventions for the treatment of amphetamine-type stimulant use in adults.

Q2. What recruitment strategies, screening strategies, mode of delivery and intervention content are employed in the identified BIs?

ANSWER 2. Table 1 - Five Preventative interventions: Recruitment. In two cases secondary students were recruited as part of their standard school curricula.[31,35] Schinke, Di Noia & Glassman (2004)[30] recruited youth from low income households through community programs in New York City. Schwinn, Schinke, & Di Noia (2010)[32] recruited girls through an online website. Cheng & Anetta (2012)[19] recruited participants as volunteers seeking to use the autostereoscopic 3D display technologies in the museum in Changhua City, Taiwan. **Screening:** None of the interventions in Table 1 screened participants. Preventative interventions were offered to all participants. **Delivery Mode:** Delivery mode included desk top computers based in a community program site[30] and in schools.[31,35] In the Schwinn, Schinke, & Di Noia (2010)[32] study the 12 sessions were accessed via an online website. Cheng & Anetta (2012)[19] delivered their intervention via a computer administered autostereoscopic 3D video booth in a museum. **Intervention Content:** The Schinke, Di Noia & Glassman (2004)[30] computer intervention presented 20 minutes of life skills curricula that was interactively prompted by youth responses to earlier questions. The content was focused on life skills problem solving and was tailored to the target participants using focus group testing. Schinke & Schwinn (2005) used a CD-ROM that included video to present a 20-minute stress management intervention. Schwinn, Schinke, & Di Noia (2010)[32] 12 online sessions covered the following life skills: goal setting; decision making; coping (particularly with stress, puberty, and bodily changes); self-esteem; assertion; communication; media influences; peer-pressure; and drug facts. The Cheng & Anetta (2012)[19] intervention covered how methamphetamine use damages and subsequently impairs stop-signal inhibition mechanisms

in the brain. Vogl, Newton, Champion & Teesson (2014)[35] presented information that included: types of drugs and their effects; problem solving; communication; and harm minimisation.

Table 2 included two BIs to treat youth amphetamine use.[26,34] **Recruitment.** Madras, et al. (2009)[25] recruited adult patients in six USA states in healthcare sites (inpatient, emergency departments, ambulatory, primary and specialty healthcare settings, and community health clinics). Marsden, et al. (2006)[26] recruited youth substance users through youth drug workers in Greater London and south-east England. Srisurapanont, Sombatmai & Boripuntakul (2007)[34] recruited young patients (mostly students aged 14 -19) seeking assistance for drug issues at the Chiang Mai University Hospital in Thailand. **Screening:** Madras, et al. (2009)[25] used self-reported drug use measures to target drug users. Srisurapanont, Sombatmai & Boripuntakul (2007)[34] targeted based on both self-reported drug use and urine tests. Marsden, et al. (2006)[26] screened based on youth drug workers asking youth questions about their drug use. **Intervention Content:** Madras, et al. (2009)[25] and Marsden, et al. (2006)[26] delivered motivational interviewing. Srisurapanont, Sombatmai & Boripuntakul (2007)[34] intervention manual covered: feedback about screening results; impairments and risks of use; advice about change options; assessment of the patient's readiness to change; goals and strategies for change; and arrangements for follow-up treatment.

Q3. What evidence is there for the effectiveness of the BIs?

ANSWER 3: There is promising but inconclusive evidence that online BIs may play a role in treating and preventing school aged youth populations from initiating illicit drug use including amphetamine-type stimulant use. The pooled effect size was small (0.09; n = 696) for reductions in substance use at follow-up[32] and reduced post-treatment frequency of methamphetamine use.[35] Evidence from pooled effect sizes suggests that brief online interventions may be effective in reducing future methamphetamine use, with larger effect sizes for reducing both intent of use and positive attitudes towards use (g = 0.58, n = 109; g = 0.98, n = 207 respectively). There have been no trials of online BIs to treat youth methamphetamine use. Of two trials of BIs to treat youth methamphetamine use results are not promising. The largest trial showed no effect[26] and the smaller trial of volunteer students only a small reduction in days of use.[34]

Strength of evidence

The evidence is still fairly exploratory and not conclusive. This is because the studies are quite diverse and hence it is hard to reach clear conclusions regarding a specific strategy. At this stage it is clear enough that there are no studies showing moderate or large impacts in reducing amphetamine-type stimulant use. The studies do demonstrate considerable innovation with a broad range of methods demonstrated for delivering BI, across a range of demographics and contexts. Additionally, innovation is also demonstrated by a large array of service delivery and curricula options. The potential flexibility is reflected in the recommendations from the Australian government encouraging the use of a broad range of BI for alcohol and other drug use in young people.[1] BI as an application of motivational interviewing appears feasible and may be inherently empowering to the end-user, since the client is encouraged to make their own decisions regarding their own health, behaviours, and any possible desire to change.

Limitations

The range of trials we identified is limited. Much of the current prevention evidence (Table 1) does not report behavioural outcomes and focuses upon risk factors such as attitudes towards current use or intention to begin or continue use. We found no online BIs offering treatment for youth methamphetamine use.

Summary of planned Australian trials

At present, a number of studies aimed at investigating the efficacy of computerised BIs for the prevention and treatment of substance use among Australian youth are being planned or are within a pre-recruitment stage. While many are documented on the Australia New Zealand Clinical Trial Registry (ANZCTR), few have published complete research protocols, with the exception of Tait, et al. (2012)[16] who plan to investigate impacts on adults. Other studies; registered in recent years and identified here by the contact author and ANCTR number, are available for perusal on the ANCTR website, but are subject to change (Casey & Hirakis: ACTRN12613000463774; Tait, et al: ACTRN12611000947909; Klein et al.: ACTRN12615000479505; Kauer et al.: ACTRN12614001223628; and Kay-Lambkin et al.: ACTRN12614000310662).

These planned studies represent the potential for reaching larger numbers of target participants that would not be possible without internet technology, and can be tailored to more specifically appeal to the desired demographic. For example, the research protocol for the study planned by Tait, et al. (2012)[16] proposes to examine the effectiveness of an internet-based BI for approximately 160 current adult users of amphetamines and stimulants. Tait and colleagues intend to randomly allocate these participants to either an intervention or a control condition, and compare substance use outcomes over three and six months. Additionally, estimates of substance use co-morbidity measures such as QoL, readiness-to-change, and psychological distress will also be measured. The approach and research design planned by Tait and colleagues is typical of much of the forthcoming research, and should go some way to addressing limitations of the current research.

Recommendations

Given some promising findings across the five preventative trials to date (Table 1), further implementation and evaluation of online BIs to *prevent* youth amphetamine-type and other substance use appears warranted. As the two trials of BIs for the *treatment* of youth methamphetamine use have not shown overall benefits, further investment in this area needs to be carefully justified. It is recommended that the proposed Tait, et al. (2012)[16] Australian treatment trial with adults be monitored.

6 References

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Included articles

18. Baker A, Boggs TG, Lewin TJ. Randomized controlled trial of brief cognitive-behavioural interventions among regular users of amphetamine. Addiction. 2001 Sep;96(9):1279-87.

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7 Appendices

Appendix Table A: Excluded papers

Paper	Citation	Reason for exclusion
Ciketic S, Hayatbaksh MR, Doran CM, Najman, J & McKetin R. 2012	Ciketic,S, Hayatbaksh MR, Doran CM, Najman, J & McKetin R. (2012) A review of psychological and pharmacological treatment options for methamphetamine dependence. Journal of Substance Use. 17(4): 363–383	Non-computerised intervention. Non-youth sample. Review article
Copeland & Martin. 2004	Copeland J & Martin G. (2004). Web-based interventions for substance use disorders: A qualitative review. Journal of substance abuse treatment, 26(2), 109-116	Qualitative literature review
Hallett J, Maycock B, Kypri K, Howat P, McManus A. 2009	Hallett J, Maycock B, Kypri K, Howat P, McManus A. (2009). Development of a Web-based alcohol intervention for university students: Processes and challenges. Drug and Alcohol Review. 28, 31–39. DOI: 10.1111/j.1465-3362.2008.00008.x	Methamphetamine outcomes not examined in paper; thematic analysis based upon participant perception of the intervention tool, not of substance use outcomes
Humeniuk et al. 2011	Humeniuk R, AliR, Babor T, Souza-Formigoni MLO, Boerngen de Lacerda R, et al. (2011). A randomised 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, 107, 957–966	Non-youth sample, not a computerised intervention
Kay-Lambkin. 2008	Kay-Lambkin F. Technology and innovation in the psychosocial treatment of methamphetamine use, risk and dependence. (2008). Drug and Alcohol Review. 27, pp 318 – 325	Literature review
Kay-Lambkin FJ, Baker AL, Lewin TJ, & Carr VJ. 2008	Kay-Lambkin FJ, Baker AL, Lewin TJ, & Carr VJ. (2008) Acceptability of a Clinician-Assisted Computerized Psychological Intervention for Comorbid Mental Health and Substance Use Problems: Treatment Adherence Data from a Randomized Controlled Trial. Addiction, 104, pp 378–388	Used a non-youth sample; paper focused upon participant experience of computer-based intervention compared with traditional therapists, not of substance use outcomes

Paper	Citation	Reason for exclusion
Kay-Lambkin FJ, Baker AL, Lewin TJ, & Carr VJ. 2008	Kay-Lambkin FJ, Baker AL, Lewin TJ, & Carr VJ.(2008) Acceptability of a Clinician-Assisted Computerized Psychological Intervention for Comorbid Mental Health and Substance Use Problems: Treatment Adherence Data from a Randomized Controlled Trial. Addiction, 104, pp 378–388	Review of studies. Non-youth sample
Kypri et al. 2010	Kyrpi K, McCambridge J, Cunningham JA, Vater T, Bowe S, et al. (2010). Web-based alcohol screening and brief intervention for Māori and non-Māori: the New Zealand e-SBINZ trials. BMC. 10	Research protocol for Kypri et al. (2014)
Riper et al. 2014	Riper H, Blankers M, Hadiwijaya H, Cunningham J, Clarke S, et al. (2014) Effectiveness of Guided and Unguided Low-Intensity Internet Interventions for Adult Alcohol Misuse: A Meta-Analysis. PLoS ONE 9(6): e99912. doi:10.1371/journal.pone.0099912	Meta-analysis
Tait, et al. 2012	Tait RJ, McKetin R, Kay-Lamblkin F, Bennet K, Tam A, et al. (2012) Breakingtheice: A protocol for a randomised controlled trial of an internet-based intervention addressing amphetamine-type stimulant use. BMC Psychiatry. 12 (67) doi: 10.1186/1471-244X-12-67. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3464697/	Research protocol, not yet recruiting as of time of this review
White et al. 2010	White A, Kavanagh D, Stallman H, Klien B, Kay-Lambkin F. et al. (2010). Online Alcohol Interventions: A Systematic Review. 12. (5)	Non youth sample, focused only on alcohol
Wolf and Shi. 2015	Wolf N,& Shi J.(2015) Screening for Substance Use Disorder Among Incarcerated Men with the Alcohol, Smoking, Substance Involvement Screening Test (ASSIST): A Comparative Analysis of Computer-Administered and Interviewer-Administered Modalities. Journal of Substance abuse treatment. 53, pp 22-32	Feasibility and reliability study examining the psychometric properties of BIs

Appendix 1: search strategy for PSYCHINFO

1. Amphetamine AND Australia* AND brief intervention (5)
2. Computer* OR internet AND intervention AND substance AND Australia * (43)
3. Methamphetamine AND intervention AND Australia* (33)
4. Methamphetamine* AND computer* intervention (1)
5. Stimulants AND Brief interventions AND Australia (3)

6. Randomised controlled trial AND Brief intervention AND computer OR internet AND Australia* (1)
7. Computer OR internet AND Methamphetamine OR Dextroamphetamine AND young people (3)

Appendix 2: search strategy for Medline

1. 1.Brief intervention AND computer* or Internet AND Australia (35)
2. Randomised trials and computer$ or internet and Australia (92)
3. Methamphetamine AND brief intervention AND Australia (1)
4. Youth OR Young Adults AND methamphetamine AND Australia (12)
5. Young adults AND methamphetamine AND Australia (7)

Appendix 3: Search strategy for Embase

1. Computer or Internet AND intervention AND Methamphetamine (30)
2. Amphetamine AND youth AND Australia. (41)
3. Methamphetamine AND Intervention AND Australia (46)
4. Brief AND intervention AND Methamphetamine (45)
5. Brief AND intervention AND computer AND Australia (46)
6. Substances OR drugs AND brief AND intervention AND Australia (74)
7. Randomised AND trial AND Computer or internet* AND Brief AND intervention AND Australia (5)
8. Computer OR internet AND Brief AND intervention AND Australia (85)
9. Substance AND use AND brief AND intervention AND Australia (75)
10. Mental AND health AND Substance AND use AND brief AND intervention AND methamphetamine (6).