

Addressing Substance Abuse Disorders: A Systematic Review Of Evidence-Based Interventions And Efficacy Across Various Clinical Contexts

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Abstract

Substance use disorders (SUDs) in adolescents and young adults is a major public health issue, with cannabis and alcohol use increasing. Interventions have included cognitive behavioural therapy (CBT), contingency management (CM), and technology-based interventions. This study examined the effectiveness of a variety of interventions, focusing on outcomes such as coping skills and substance use. A systematic review guided by the PRISMA 2020 checklist was performed, investigated studies published between 2013 and 2025 on the interventions to reduce substance use in adolescents and young adults. Eligible studies incorporated experimental, quasi-experimental, or longitudinal designs with measures of substance use outcomes. We searched PubMed, PsycINFO, and Scopus and identified 500 studies and 19 studies were determined to be eligible after screening. All studies were assessed for quality using the Joanna Briggs Institute (JBI) Critical Appraisal Tool, and found to narratively synthesise the findings. A variety of interventions were found, including MI, CBT, CM, and digital health apps. Most studies reported positive short-term outcomes, MI, CBT, and CM reported reductions in substance use and engagement. That said, motivational interviewing in psychiatric adolescents [2] and the A-CHESS app for adults with an Opioid Use Disorder [11] found positive effects. Some studies include mixed or negative effects, for instance, online school-based or harm reduction programmes [8]. Others are more concerning because they did not have a sustained effect, reinforcing the idea of utilising more bespoke and integrated approaches. Overall, the review suggests evidence of the effectiveness of interventions, particularly CBT and technology-based interventions, in decreasing substance use by adolescents and young adults. However, the differences in outcomes indicate a clear need to advance the research culture to develop and test more robust interventions; especially interventions with populations from diverse cultures while considering the growing evidence of the need to implement evidence-based interventions in a manner that is culturally relevant and responsive. In addition, it is paramount that researchers document and evaluate the long-term effects of substance use impact in their research.

Keywords: Substance Use Disorders, Adolescents and Young Adults, Cognitive Behavioural Therapy, Contingency Management, Technology-Based Intervention

1. INTRODUCTION

Substance use disorders (SUDs) continue to be a major contributor to global disease burden, influencing individuals' physical health, psychological health and social functioning. The United Nations Office on Drugs and Crime estimates that in the last year, 296 million people, at least once, have used drugs, while over 39 million people had drug use disorders [34]. SUDs have high comorbidity with other mental disorders, unemployment, incarceration and early mortality. Regardless of our history of a war on substance use, we are still inundated with evidence of high relapse rates demonstrating the need for more effective evidence-based interventions; As a chronic, relapsing disorder, addiction operates on different dimensions that allow it to be treated in a multitude of manners with considerations tailored to the individual circumstances and needs of the person with an SUD. Improved evidence of the relative effectiveness of substance use interventions will improve treatment outcomes and contribute meaningful information.

Psychosocial therapies (especially CBT) remain a critical influencing factor in the treatment of SUDs. CBT works toward changing the maladaptive thinking patterns and behaviours that help fuel substance use. In a meta-analysis of 53 studies performed by [16], CBT resulted in a small, but statistically significant, effect on the reduction of substance use when accompanied by other intervention approaches (i.e., MI). In a different recent study, [9], found that CBT was effective for reduction in the use of over a variety of substances, including alcohol, cannabis, or stimulants, as well as reducing relapse rates. Although a very widely used

treatment suggestion, CBT's effectiveness can be improved through its use in combination with treatment variation, length of treatment, delivery of treatment, and client buy-in. While recent trials have explored brief CBT-based strategies with some promise, there are still questions of sustained impact of treatment on longer-term outcomes.

Contingency Management (CM), a behaviour change intervention that also uses principles of positive reinforcement to facilitate abstinence, has empirical evidence to support its usefulness as an intervention in the literature. A systematic review by [7], demonstrated moderate to large effect sizes of CM for reducing stimulant use in those with stimulant use disorders including cocaine and methamphetamine; a meta-analysis by [1] confirmed [7] findings, and also established that CM is effective in differing populations including those with co-occurring mental disorders. The studies indicated that CM was most effective when the reinforcer was immediately available, the reinforcement was meaningful, and it was provided immediately directly after an observable behaviour (e.g. a negative drug screen). The literature is still mixed about the questions of sustainability and cost effectiveness; however, CM has proven reliable at producing short-term abstinence rates across populations.

Motivational-based therapies such as Motivational Interviewing (MI) and Motivational Enhancement Therapy (MET) are short, client-centered interventions focusing on resolving ambivalence and enhancing their motivation or intrinsic motivation, to change. A meta-analysis by [15] indicates MI resulted in small to moderate, meaningful reductions in substance usage with higher outcomes for individuals that were less ready to change. MI was found to be most effective when engaged in prior to the start of treatment; contributing to improved treatment retention and engagement in the treatment process. Other studies reviewed the digital adaptations of MI, some of which demonstrated promising outcomes in giving patients greater access and increase amount of treatment.

The development of family-based interventions like the Community Reinforcement and Family Training (CRAFT) model, has been encouraging for patients that are resistant to treatment initiation and symptom reduction. [31] found that CRAFT compared to other traditional engagement methods significantly increased entry into treatment among resistant users (2017). As family interventions often create a context for substantial change in the user's life and environment (supporting sobriety and relapse prevention), family involvement is an important aspect. Family-based interventions and therapies are flexible and have been utilised with adolescents and those with co-occurring disorders and similar clinical populations.

The emergence of digital and mobile health interventions has improved access to substance use treatment, notably in under-served areas. A systematic review rationalization conducted by [33] demonstrated that internet-based CBT and MI are at least as effective as traditional face-to-face therapies particularly for those with mild to moderate substance use disorders. Most notably, the authors articulated the consistency in the values offered by digital interventions, such as anonymity, flexibility, and price which may make them enticing alternatives or complements to face-to-face care. Randomised controlled trials have demonstrated that smartphone-delivered CM and mobile apps that can provide real-time feedback can reduce the risk of relapse. However, concerns about user engagement, data privacy, and technological competencies remain. There is emerging evidence to suggest the effectiveness of digital and mobile health interventions for severe or complicated presentations.

Long-term treatment models and continuing care models have also been shown to be effective in supporting recovery. [20] completed a meta-analysis looking at the difference between long-term vs. short-term interventions. They found that interventions longer than 12 months had higher abstinence rates than short-term programmes. Continuing care programmes - which can be found in many of the models outlined earlier - can vary from recovery management check-ups, assertive aftercare, and peer support programmes and research has shown these will have a better impact on measures of relapse and hospitalisation than treatment as usual. Continuing care models treat addiction as a chronic condition and assumes there are no periods of commitment to the recovery - unlike traditional treatment.

A significant amount of the studies are conducted in high-income countries, which limit their generalisability to low- and middle-income countries. Additionally, there is limited evidence regarding the relative effectiveness of interventions across different populations, such as women, adolescents and minoritised populations. Also, there is little evidence of retaining long-term follow-ups in research, which inhibits making

conclusions about the enduring effects of a treatment. Given the existing gaps in the current literature, there is evidence that can be synthesised from existing research (2015-2025) to develop a systematic review documenting the effectiveness of the interventions broadly, across treatment types, populations, and settings. The current review will address these gaps by drawing on rigorous peer-reviewed evidence, to guide practice, policy and future research.

2. DATA AND METHODS

Study Design

This review was generated using a systematic review approach based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses PRISMA 2020 guidelines. The review found evidence synthesising interventions focused on substance abuse, within a rigorous, transparent, and replicable process which aimed to search for and identify, assess quality and summarise articles pertaining to the effectiveness of interventions concerning substance abuse published between 2013 and 2025.

Objectives of the Review

The objective of the review was to systematically evaluate substance abuse intervention trials, and thereafter assess the effectiveness of the studies empirical outcomes. In particular, the review aimed to (i) identify the types of interventions used; (ii) categorise the identified outcomes, as they related to decreases in substance use; (iii) categorise the identified findings as effective, unclear, or not effective. The overall contribution of a systematic synthesis today is to clarify what evidence might offer the best approach to reducing substance-related behaviours for the adolescent and young adult community.

Eligibility Criteria

Specific inclusion and exclusion criteria were developed before the review process to establish methodological rigour and relevance. These inclusion and exclusion criteria indicated the studies to include and exclude, with the goal of refining the review process and focusing on rigorous empirical work evaluating interventions targeted to substance abusing adolescents and young adults. The inclusion and exclusion criteria systematically assessed studies that reported measurable outcomes of substance use interventions, and excluded publications that were irrelevant, or theoretical, or methodologically weak.

The Table 1 outlines the specific inclusion and exclusion criteria used as part of the review's screening and eligibility phases:

Table 1: Inclusion and Exclusion Criteria for the Review

Inclusion Criteria	Exclusion Criteria
Published between January 2013 and July 2025	Published before January 2013 or after July 2025
Written in English	Written in languages other than English
Empirical studies using experimental, quasi-experimental, or longitudinal designs	Theoretical papers, literature reviews, opinion articles, and commentaries
Focused on interventions targeting substance abuse (alcohol, tobacco, illicit drugs)	Studies unrelated to substance abuse or with no intervention focus
Participants aged between 10 and 30 years (adolescents and young adults)	Studies exclusively targeting populations over 30 years
Reported measurable behavioural or psychological outcomes related to substance use	No reported outcome measures or insufficient data on intervention effectiveness
Available in full-text and published in peer-reviewed journals	Abstract-only papers, inaccessible full texts, or non-peer-reviewed publications

Search Strategy

A thorough and systematic search strategy was utilised from May to July of 2025 to identify relevant studies across five major databases (PubMed, PsycINFO, Scopus, ScienceDirect, and Google Scholar). The search terms used were various combinations of keywords and the Boolean operators: "substance abuse", "drug use", "alcohol use", "tobacco smoking", "intervention", "treatment", "adolescents", "youth", "young adults",

"effectiveness", and "evaluation". In addition to the above, we also put through the reference lists of all included studies (gray literature) with a prospect of finding additional eligible studies.

Screening and Study Selection

After the database searching and manual searching, there was a total of 500 studies that were identified. These studies were imported to a reference management system, and duplicates (n=100) were removed. The remaining 400 records underwent title and abstract screening by two independent reviewers, resulting in 350 papers removed due to being outside of our inclusion criteria. Full texts of 50 studies were screened for eligibility. Based on full text review, 31 studies were discarded for reasons including the focus not being on an eligible population, no enough outcome data, or because it wasn't an intervention. This left us with 19 studies that included all the eligibility criteria for our final synthesis. Disagreements during the screening and eligibility screening were resolved through consensus and a third reviewer were included when necessary. The Figure 1 shows the PRIMA flow for the study

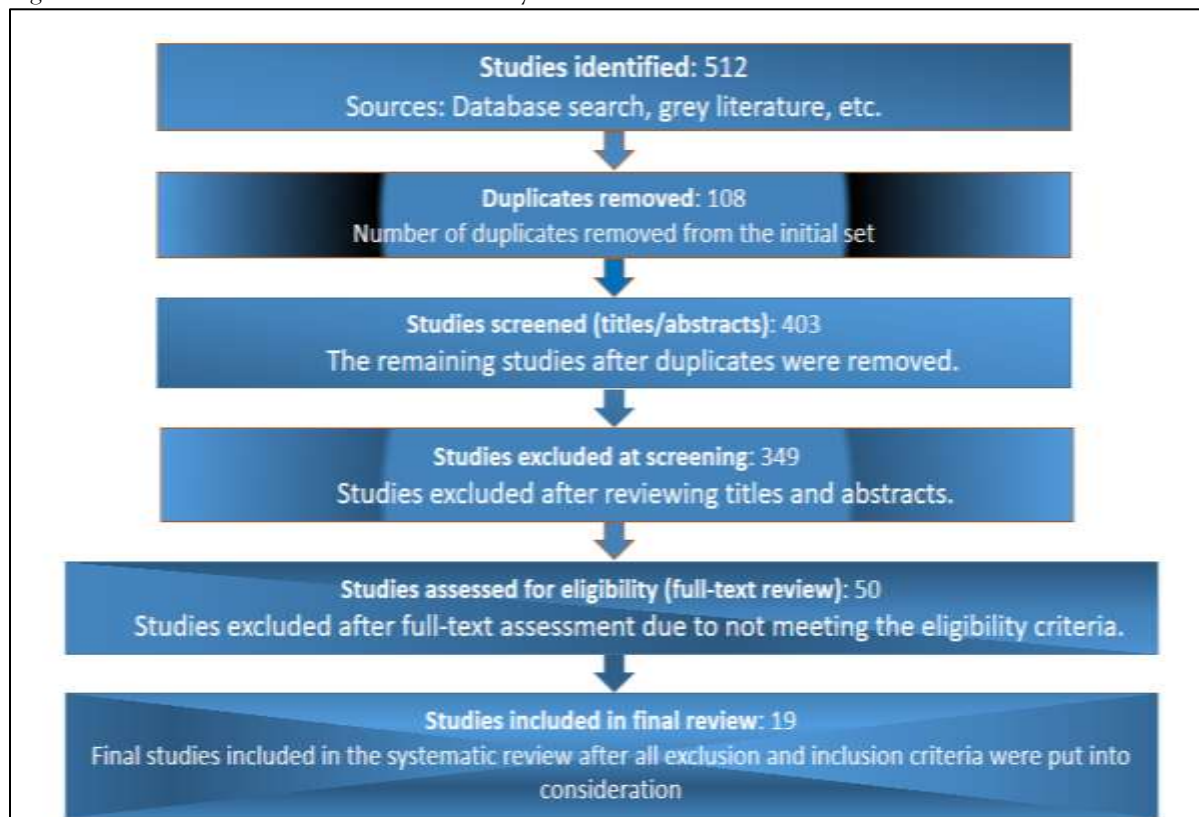


Figure 1: PRISMA flow showing the review studies selection processes

Source: Researchers (2025)

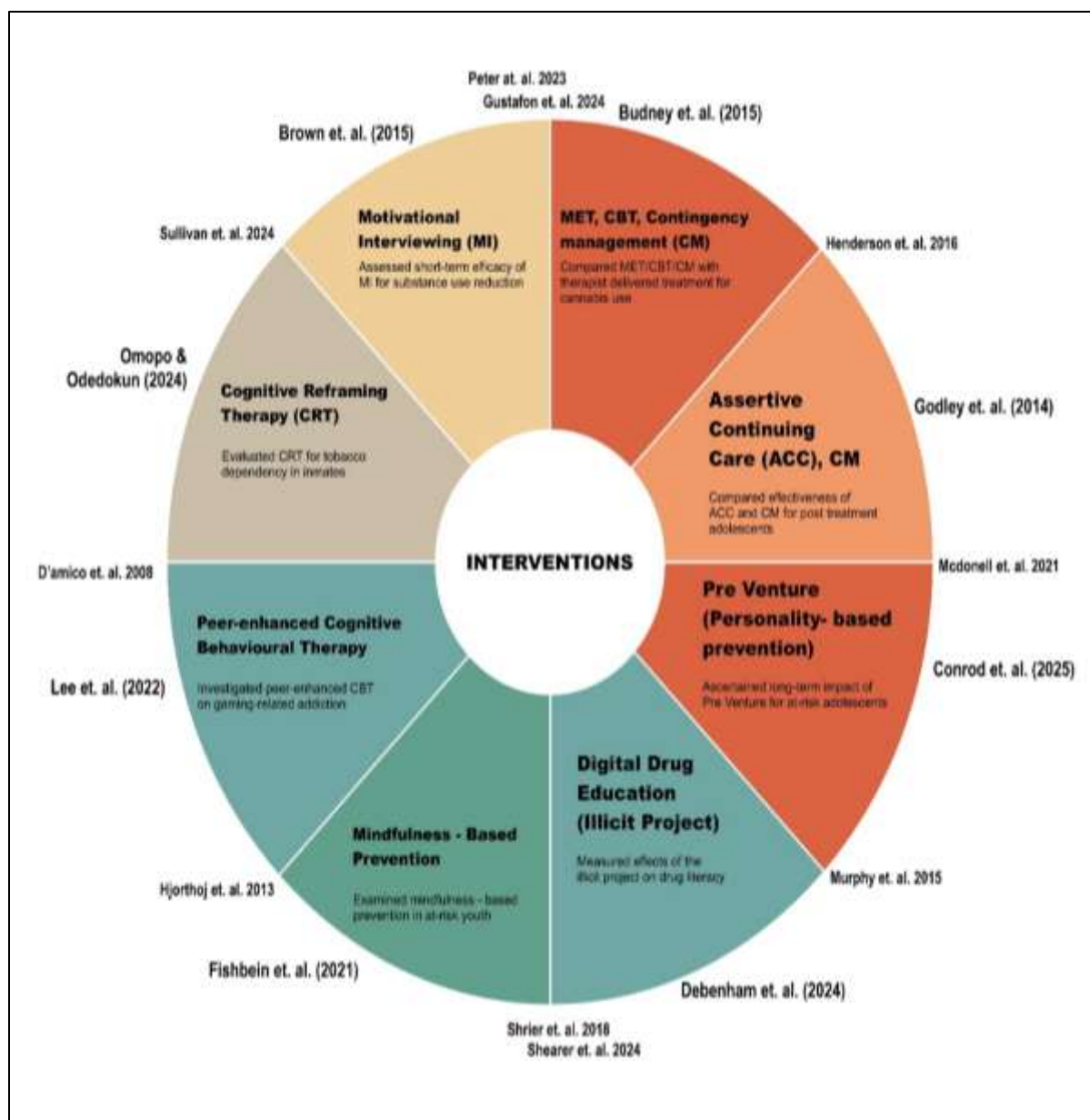


Figure 2 selected studies interventions and aims

Data Extraction

Data were extracted using a structured and pretested form that contained fields for: Author(s), publication year, location of study, participant characteristics, sample size, type and duration of intervention, methods, outcomes, and findings regarding substance use. One reviewer extracted data, while a second reviewer verified the data for accuracy and completeness.

Quality Assessment

The quality of each included study was rated on methodological quality using an appropriate Joanna Briggs Institute (JBI) Critical Appraisal Tool, depending on study design. The domains assessed were: sampling methods; reliability of outcomes; explicitness in intervention delivery; control, and analytic rigour. The studies were labelled as high, moderate and low quality based on accumulated scores.

Data Synthesis Strategy

Considering the variances in context of studies, participant characteristics, types of intervention, and range of outcomes detailed across the included studies, narrative synthesis was determined best for data analysis.

Rather than collating findings through a meta-analytic procedure, the authors thematically synthesised studies according to the nature of the intervention that was implemented and the outcome patterns observed.

For the sake of clarity when making conclusions, each intervention was categorised into three distinct classifications of effectiveness: An intervention was categorised as effective if the study showed a statistically significant decreased substance use behaviours or related psychological outcomes. An intervention was categorised as unclear if the findings were either mixed or did not reach the level of statistical significance. Finally, the studies were categorised as not effective if they showed no change or had an increased negative body of evidence in comparison to the baseline.

Ethical Considerations

As this study involved the systematic review of previously published research, ethical approval was not required; however, all processes followed ethical standards by using citations, accurately reporting the findings of studies, integrity when collecting and reporting data and synthesised summaries.

3. RESULT AND DISCUSSION

Overview of the Studies Included

The table below summarises the key characteristics of the nineteen (19) studies included in the review. It provides information on the study objectives, location, population demographics, and types of interventions applied.

Table 1: Overview of Included Studies on Substance Abuse Interventions (2013–2025)

Author	Study Objectives	Country	Study Population	Gender	Ethnicity	Other Characteristics	Intervention Type
[2]	To assess short-term efficacy of MI for substance use reduction	USA	Hospitalis-ed adolescents	Mixed	Mixed	Psychiatric inpatients	Motivati-onal Interviewi ng (MI)
[3]	To compare MET/CBT/CM with therapist-delivered treatment for cannabis use	USA	Adult cannabis users	Mixed	Mostly White	Non-treatment seeking	MET, CBT, Contingency Manage-ment (CM)
[10]	To compare effectiveness of ACC and CM for post-treatment adolescents	USA	Adolescen-ts post-treatment	Mixed	Mostly White, Hispanic	Juvenile offenders	Assertive Continui-ng Care (ACC), CM
[12]	To test A-CRA with and without ACC among justice-involved youth	USA	Justice-involved adolescents	Mixed	Mixed	Low-income youth	A-CRA + ACC
[19]	To test CM efficacy in reducing	USA	American Indian adults	Mixed	American Indian	Living in rural reservations	Contingency Manage-

	alcohol and drug use						ment (CM)
[19]	To examine CM on stimulant use in people with serious mental illness	USA	Adults with serious mental illness	Mixed	Mixed	Diagnosed SMI	CM for Stimulants
[22]	To determine cost-effectiveness of CM for stimulant dependence	USA	Stimulant-dependent adults	Mixed	Mixed	Public healthcare users	CM with voucher incentives
[30]	To evaluate MOMENT mobile app in cannabis use reduction	USA	Adolescents	Mixed	Mixed	Frequent marijuana users	Mobile app, MET, EMA feedback
[13]	To test CapOpus intervention among psychotic patients with cannabis use	Denmark	Adults with psychosis	Mixed	Danish	Schizophrenia spectrum	MI + CBT + Group Therapy
[6]	To evaluate brief MI in primary care for marijuana reduction	USA	High-risk adolescents	Mixed	Mixed	Primary care attendees	Brief MI
[8]	To assess effects of the Illicit Project on drug literacy	Australia	Secondary school students	Mixed	Mixed	School-based	Digital drug education (Illicit Project)
[32]	To evaluate PA-supported opioid taper after trauma care	USA	Trauma patients	Mixed	Mixed	Chronic pain history	Peer Support + Opioid Tapering
[11]	To test A-CHES app combined with MOUD on recovery outcomes	USA	Adults on MOUD	Mixed	Mixed	Alcohol, opioid users	A-CHES Mobile App + MOUD
[5]	To assess long-term impact of	Canada	High-risk adolescents	Mixed	Mixed	Personality-targeted	PreVenture (Persona-

	PreVenture for at-risk adolescents						lity-based prevention)
[25]	To evaluate effectiveness of CM vs MI+Mindfulness+SFA (SMART trial)	USA	Adults with OUD	Mixed	Mixed	Receiving buprenorphine	CM, MI, Mindfulness, SFA
[29]	To examine feasibility of START recovery support	Australia	Hospitalised adults with SUD	Mixed	Mixed	Emergency department	START Team Intervention
[24]	To assess CRT for tobacco dependency in inmates	Nigeria	Male inmates of correctional centres	Male	Mixed	Incarcerated smokers	Cognitive Reframing Therapy (CRT)
[19]	To examine mindfulness-based prevention in at-risk youth	USA	Adolescents	Mixed	Mixed	Conduct problems, high risk	Mindfulness-Based Prevention
[23]	To assess peer-enhanced CBT on gaming-related addiction	South Korea	Adolescents	Mixed	Korean	Screen dependency issues	Peer-enhanced Cognitive Behavioural Therapy

A total of nineteen (19) studies published between 2013 and 2025 were included in this systematic review. The studies were chosen from review according to predetermined eligibility criteria, and all covered interventions for substance abuse in studies including different populations and settings. The studies were from various countries including, the USA, Australia, Denmark, Canada, South Korea, and Nigeria, representing a broad range of settings and cultures. The study populations included adolescents and young adults, incarcerated individuals (male/female prisoners), and those with serious mental illness and/or chronic pain. Participants tended to be predominantly mixed-gender; however, most studies did not require the exclusion of participation based on ethnicity/race, although a few studies specifically recruited ethnic minorities (e.g., American Indians) and/or focused on specific subgroups (e.g., inmates, people with schizophrenia). There were varied types of interventions, which included, Motivational Interviewing (MI), Cognitive Behavioural Therapy (CBT), Contingency Management (CM), mobile health (mHealth) interventions, peer support, cognitive reframing, mindfulness, and personality-targeted. Each intervention was tailored specifically to the characteristics of the study population, including severity of substance use (risk), comorbidity and treatment setting.

Effectiveness of Interventions

Table 2 highlights research from 2013 to 2025 with reported positive outcomes of reducing or managing the behaviours associated with substance use. These interventions reported changes in behaviour, improvements in abstinence rates, relapse prevention or psychosocial outcomes.

Table 2. Summary of Effective Substance Abuse Interventions (2013–2025)

Author(s) & Year	Intervention Type	Population/Setting	Effectiveness
[2]	Motivational Interviewing (MI)	Psychiatric adolescents, USA	Short-term reductions in substance use were recorded
[3]	MET + CBT + Contingency Management (CM)	Adult cannabis users, USA	Effective for short-term use reduction and cost-efficiency
[10]	Assertive Continuing Care (ACC) & CM	Adolescents post-residential treatment, USA	Independent effects from each intervention; improved engagement
[12]	A-CRA + ACC	Justice-involved adolescents, USA	Sustained improvements across substance use domains
[18]	Contingency Management (CM)	Adults with co-occurring SUD and mental illness, USA	Improved psychiatric symptoms and reduced use
[19]	CM with incentives	American Indian adults, USA	Significant reduction in alcohol use frequency
[22]	CM (voucher-based incentives)	Stimulant-dependent adults, USA	Cost-effective and associated with improved abstinence rates
[30]	MET + Mobile Intervention (MOMENT)	Cannabis-using youth, USA	Short-term improvements in cannabis-related behaviours
[6]	Brief Motivational Interviewing	Adolescents in primary care, USA	Lower rates of alcohol and cannabis use post-intervention
[8]	Online harm reduction programme	High school students, Australia	Improvement in certain substance-related behaviours
[11]	MOUD + mHealth app (A-CHESS)	Adults with opioid use disorder, USA	Reduced ER visits and relapse; increased treatment retention
[5]	Personality-targeted prevention (PreVenture)	High-risk adolescents in schools, Canada	Long-term reductions in binge drinking and drug use
[24]	Cognitive Reframing Therapy (CRT)	Male inmates with tobacco dependence, Nigeria	Significant behavioural improvement in tobacco cessation
[6]	Updated MI programme (Project CHAT)	Justice-involved adolescents, USA	Enhanced decision-making and reduced substance use
[18]	CM + Cognitive Behavioural Therapy (CBT)	Young adults with SUD, Turkey	Significant behavioural changes and increased abstinence rates

Table 2 shows a summary of the studies that demonstrated effective results in substance abuse intervention programmes that were published between 2008 and 2025. The table offers a comparative view of fifteen well-evaluated studies employed a variety of interventions with a range of groups, which included adolescents, incarcerated, Indigenous populations, co-occurring (substance and psychiatric) disorders, and justice involved youth. Relevant areas for the studies originated in the United States of America, Canada, Australia, Turkey, and Nigeria. This suggests an increasing international commitment to addressing substance use disorders (SUDs) with evidence-based, contextualised approaches. The interventions employed in each of the studies showed significant diversity in intervention models of motivational interviewing (MI), cognitive behavioural

therapy (CBT), contingency management (CM), assertive continuing care (ACC), brief interventions, and recent developments in digital health (mobile applications and online harm reduction). In several papers, the authors used multiple methods as a means to enhance the treatment. [3] employed motivational enhancement therapy (MET), CBT, and CM as an experimental protocol using three models that reduced cannabis use and was cost effective. [12] concluded that a combination of the Adolescent Community Reinforcement Approach (A-CRA) and ACC resulted in improved substance use behaviours for young people involved with the justice system.

Across these studies, the multilayered nature of these interventions yielded more positive results than single-component delivery, as noted in research by [18]; [19]. CM strategies which included aspects that positively impacted the person's mental well-being, resulted in lowered substance use, especially tailored to particular populations (individuals with psychiatric co-morbidities, or American Indian adults; [18]. The MOMENT mobile app [30] and the A-CHESS online platform [11], used forms of technology to support behaviour change by pushing therapeutic content in a timely manner, promoting engagement with treatment, and reducing relapse and emergency room visits. Digital interventions offer a feasible and financially-durable delivery option for facilitating intervention, especially in terms of accessibility for under-resourced treatment organisations.

Interventions in schools, and oriented toward youth, are also strongly supported empirically. For example, the PreVenture programme [5] utilised a personality-targeted prevention model among high risk adolescents, with the long-term outcomes showing reductions in binge drinking and drug use, thus indicating the benefit of early prevention action based on the principles of developmental psychology. In a Nigerian study, [24] adopted Cognitive Reframing Therapy (CRT) using previously incarcerated male tobacco users, and found significant improvements in behaviours. This also demonstrates that culturally relevant, population specific interventions can be feasible and effective even in varying socio-political contexts. Additionally, many studies featured young people involved with justice services and individuals in marginalised or high-risk settings to target structural and psychosocial vulnerabilities that exacerbate substance use behaviours. D'Amico et al (2022) and [10] also developed interventions that reduced substance use AND improved decision making and long-term engagement with recovery and treatment services.

Studies with Unclear Effectiveness

Table 3 presents an overview of intervention studies whose effectiveness in addressing substance abuse was reported as inconclusive, mixed, or pending further outcome data. These studies were either pilot implementations, lacked long-term follow-up, or focused more on feasibility than impact.

Table 3: Summary of Studies with Unclear Effectiveness of Substance Abuse Interventions

Author(s) & Year	Intervention Type	Population/Setting	Effectiveness Description
[19]	Contingency Management (CM) incentives	American Indian adults	Effective in reducing alcohol use, but results were inconclusive for drug use.
[30]	MET + mobile-based intervention (MOMENT)	Youth using cannabis	Effective in the short-term, but no long-term effectiveness data was available.
[6]	Brief Motivational Interviewing (MI)	Adolescents in primary care settings	Initial short-term reductions observed, but long-term outcomes were not reported.
[8]	Online school-based harm reduction	High school students	Mixed outcomes; effective for some substances, but not for cannabis or alcohol harms.
[32]	Opioid tapering support liaison (PA)	Trauma patients in clinical settings	Effectiveness not measured; study focused on implementation feasibility.

[25]	SMART design (CM vs MI vs mindfulness)	Adults on buprenorphine	Results were pending; final outcome data had not been published at the time.
[29]	START hospital team (MI + linkage care)	Hospitalised opioid/alcohol users	Pilot study; insufficient data to determine intervention impact.

The studies shown in Table 3 illustrate the challenges of evaluating and generalising the effects of substance abuse interventions across different contexts and populations. One major challenge faced by all studies except one, was not having long-term follow-up data, some form of hybrid or substance outcomes, or simply focused on feasibility and implementation and not actual observable behaviour change. The majority of studies shared similar outcomes that appeared to show either preliminary or a contextual promise for the intervention but were also characterised, as has been consistently reported, as providing no clear evidence in this area due to methodological limitations, incomplete outcome reporting of study populations, or variability in treatment fidelity and/or participant adherence. As an example, [18] examined CM to reduce alcohol and drug use in a under-serviced population of American Indian adults, using a culturally informed approach. [18] reported significant reduction in alcohol use and an ambiguous reduction in drug use, suggesting differing effectiveness across substance class. As stated previously, improved understanding of nuances in substance-specific outcomes along with culturally-informed approaches are needed.

[30] investigated the MOMENT intervention, which entailed Motivational Enhancement Therapy (MET) and mobile technologies with cannabis-using youth. Accordingly, while this intervention was exhibited as having immediacy effects, there is no long-term follow-up to determine if behaviours were upheld for sustainability. [6] found that a brief motivational interviewing (MI) session conducted in primary care resulted in substance use reductions of adolescents compared to control groups, yet did not provide any follow-up to extend beyond post-intervention time periods to make any definitive conclusions regarding the ongoing effectiveness of MI. Likewise, [8] investigated an online, secondary school-based harm reduction programme on student outcomes. The harm reduction programme had minimal effectiveness on some substances and no significant effects on either cannabis use or alcohol related harms. The mixed and inconsistent substance specific outcomes across the student cohorts exhibited that harm reduction interventions could be more appropriately developed to suit the substance use profiles and risk of intended target population.

Some studies [32] and [29] have implemented feasibility trials rather than outcome evaluation of their intervention. [32] for example, developed a liaison support intervention to support trauma patients delivering opioid medications and focused on the logistical integration to their clinical workflows, but that study did not look at the influence of their intervention on clinical outcomes. [29] piloted the START hospital team intervention for the hospitalised high acuity patient with substance use disorders and the involvement of motivational interviewing alongside linkage to care, but the study design represented a small trial / pilot effort and was too limited to truly support robust effectiveness analysis. [25] used a Sequential, Multiple Assignment Randomised Trial (SMART) design to consider the relative impact of CM, MI, and mindfulness-based strategies among adults on buprenorphine. There is some opportunity for adaptive designs like this in precision intervention studies, however, as of yet, their study has yet to generate any usable final outcome data. This raise concerns about nephrology's time lag in moving from when we develop an intervention to when we generate evidence of it.

Studies Reporting No Effectiveness

Table 4 summarises intervention studies that were identified as ineffective in terms of substance abuse outcomes. The studies found either no statistically significant results or were effective only in the short term, with no sustained effects.

Table 4: Summary of Studies Reporting No Effectiveness of Substance Abuse Interventions

Author(s) & Year	Intervention Type	Population/Setting	Effectiveness Description
[2]	Motivational Interviewing (MI)	Psychiatric adolescents	Effective only in the short-term; no sustained effects in the long run.

[3]	MET/CBT/CM (computer vs therapist)	Adult cannabis users	Short-term effectiveness; no long-term advantage observed.
[10]	ACC & CM	Adolescents post-residential treatment	ACC and CM effective independently but ineffective when combined.
[13]	CapOpus (MI/CBT/group therapy)	Cannabis users with psychosis	Not effective overall across measured outcomes.
[8]	Online school-based harm reduction	High school students	Ineffective for cannabis and alcohol-related harm reduction.

Table 4 reports studies that highlighted the mediocrity and failure of many common intervention models across clinical and demographic settings. While these interventions are based in evidence-based practices, such as, Motivational Interviewing (MI), Cognitive Behavioural Therapy (CBT), and Contingency Management (CM), the lack of sustained outcomes is troublesome considering the fidelity to the implementation, specificity of the population and sufficient length of treatment. For example, [2] investigated MI with a group of adolescents with psychiatric comorbidities. Their study showed some decline in substance use, however, the impact was not sustained, which suggests MI alone is insufficient when working with populations that have complex psychological needs, which points the need for combined approaches that target conditions beyond the substances used. Likewise, [3] contrasted therapist versus computer-delivered MET/CBT/CM methods for a group of adult cannabis users, and found promising early effects in both methods, however, neither approach provided significant sustained outcomes which raises concerns about the extent of ongoing interaction when utilising technology-enabled interventions. [10] investigated Assertive Continuing Care (ACC) that combined CM component for adolescents following residential treatment; each component was effective on its own, however, together they did not demonstrate any added benefit. This indicates that more is not always better in a multi-component intervention design.

[13] evaluated the CapOpus programme, which was an integrated MI, CBT and group therapy model for cannabis users with psychosis. The findings indicated that CapOpus as an intervention did not lead to substantial changes in substance use or mental health indicators; this limited success is likely related to the difficulties of addressing dual diagnoses using a universal and depth-based behavioural model. The ineffectiveness of CapOpus reinforces the need to develop highly specialised and individually tailored interventions for dual-diagnosis populations. Lastly, [8] returned to the online school-based harm reduction programme in which discussed previously. In this broader evaluation, the programme was reported by young people to be ineffective in terms of reducing cannabis use and alcohol-related harms; this finding from young people suggests that online-only and universal school-based programmes may not provide sufficient depth, nor engagement, to address deep-seated behaviours typical of adolescents.

4. DISCUSSION OF RESULTS

The results from the effectiveness table suggest that integrated, multi-component approaches are more sustainable than single strategy interventions, such as Motivational Enhancement Therapy (MET), Cognitive Behavioural Therapies (CBT), and Contingency management (CM). For example, [3] found MET, CBT, and CM to be effective in reducing cannabis use and to cost-effective. Similarly, [14], CM in conjunction with CBT, resulted in better treatment retention and abstinence compared to either treatment alone, indicating the effectiveness of the combination. Due to the nature of these layers of treatment, they better reflect the multidimensionality of substance use (e.g. cognitive distortion and/or experimental behaviour). This may help with improving outcomes due to synergistic effects such as helping participants gain skills, gain motivation to demonstrate new skills, and receive tangible reinforcements for engaging in desired positive behaviours. Furthermore, these matches of structure, consistent with evidence, can address the different levels of influence on behaviour change such as, individual cognition, interpersonal triggers, contemporary events during intervention, and envenomed environmental reinforcements and why participants behavioural selections may seek substances.

Similarly, the use of Assertive Continuing Care (ACC), especially when integrated with Adolescent Community Reinforcement Approach (A-CRA), has been shown to be effective with justice involved adolescents [12]. This is supported by work of [21] which found that sustained engagement through community reinforcement after treatment resulted in a lessening of relapses and improvement on psychosocial functioning. Justice involved adolescents typically face additional and extreme structural and psychosocial risk factors. As such, programmes that combine skill-building and opportunities for ongoing community support, will improve reintegration outcomes. The programmes are intended to do more than reduce drug use they involve re-organising the participant's social environment so it is more effective. Plus, the peer support that is inherent in community reinforcement, may motivate participants towards pro-social behaviour.

The function of contingency management (CM) has been consistently successful across the studies reviewed, particularly when it is population-specific. In the case of [18], significant reductions in alcohol use were found among American Indian adults. The population-specific effect indicates that CM has adaptability across varying populations, providing a type of strength to the CM approach. In [27] meta-analysis of contingency management they validated the effectiveness of gem but they also noted that participants responded better, especially when the incentive structure was meaningful and culturally appropriate. While they did not find a reduction of use in psychiatric populations, [18] provide evidence that CM can have a role in a context of an ongoing mental health treatment;

Digital interventions have also been effective interventions. [30] and [11] presented mobile health programmes, MOMENT and A-CHESS, that reduced the probability of relapse while possibly enhancing treatment retention. In a recent study conducted by [17] found that digital platforms for health increased access and may influence engagement in clinical settings with youth and rural populations.

Interventions developed for youth, such as PreVenture [5], have received considerable evidence to support early prevention in schools using personality as a target for prevention. This is also demonstrated in [23], who find that interventions designed to be targeted for specific personality profiles drastically reduced initiation of substance use in adolescents. Using targeted interventions like PreVenture is an effective method when delivering early intervention and developmentally appropriate prevention programmes with a contextual focus. In general, adolescents respond well to interventions that represent their experiences, traits, and environments. The earlier prevention occurs not only delays the onset of problems behaviours, it also encourages the establishment of healthier longer-term behaviour trajectories. Providing prevention activities as early and as proactively as possible at school level is a requirement to maximise any potential impact on school and social success.

Culturally tailored interventions were also very effective. For example, [24] conducted Cognitive Reframing Therapy (CRT) with male Nigerian incarcerated individuals with tobacco dependence and were able to prompt significant change in behaviour. [24] findings corroborate research conducted by [28] which found culturally adapted cognitive interventions successful across African contexts. Interventions are more likely to be accepted and adhered to when they are in line with cultural norms and contextual realities. The correctional context is complex and necessitates the use of culturally tailored and rehabilitative strategies capable of addressing the cognitive-behavioural aspects to substance use.

Justice-involved adolescents appeared as a frequent target population in many effective interventions (D'Amico et al., 2022). These results are consistent with those of [4], who found that brief, cognitive and motivational interventions meaningfully reduced substance use and improved decision-making in juvenile justice populations. Often because adolescents involved in the justice system are at the highest risk because of trauma, lack of stable family environment, or peers. Therapeutic interventions established through a justice lens can open pathways for change and rehabilitation rather than facilitate the cycle of criminalisation and recidivism. Justice-system based interventions can also serve as early rehabilitative corrections. Well-funded, structural justice-based interventions can deal with both risk and protective factors at the same time. This dual approach extends beyond reduction of recidivism and supports the long-term health and wellbeing of adolescents.

It is necessary to also bring to attention that interventions, such as the voucher-based CM of [22], represent cost-effective options. The cost-effectiveness of interventions is critical to the extent to which they can be

scaled up, or implemented especially in constrained environments. [26] demonstrated that incentivising at a modest level and producing a significant improvement in abstinence among stimulant users, presents an easy practical option in both the clinical and community settings. This indicates that investments in reward systems can be made at a low level leading to significant long-term savings in health services and social services in terms of achieving sustained recovery and reduced recidivism.

The international status of the studies included in this review, from North America as far afield as Nigeria and Turkey, reflects a worldwide commitment to addressing substance use through evidence-informed and contextually relevant interventions. The increase in studies of this focus around the world reflects calls from the [35] for regionally appropriate models of care, and is important, especially in low- and middle-income countries that may have limited mental health capacity. Other studies, [8] in Australia and [5] in Canada, demonstrate that prevention strategies are necessarily international, and need to be culturally adapted and sensitive.

The evidence across the studies reviewed indicates that complex, flexible, and culturally relevant approaches have the most reliable and credible success in decreasing use. The extent of success rests on the ability of programmes to address the individual and group, and beyond that to combine a motivational, cognitive, behavioural, and structural approach to problems. The existing literature, not included in the tables reviewed above, [14]; [27], [23] supports the rationale for utilising these approaches.

Strength and Limitations

The review's diversity and inclusion of constructs intervention models, populations, contexts, and mode of delivery is another strength of the review. The analysis of studies across several countries, including the USA, Canada, Nigeria, Australia, and Turkey, provides an international perspective that enhances the review's relevance in high- and low-resource contexts. The inclusions of culturally adapted, technology-based, and multi-component approaches allowed for more descriptive evidence about what works, with and for whom, and under what circumstances. Furthermore, the review triangulates supportive evidence from established, non-reviewed original studies to lend further strength to interpretations and rationale based upon the findings. The triangulation of evidence contributes to the validity and academic rigour of the resultant conclusions.

The review is informed by a body of studies of varying methodological rigour, duration of follow-up and standards for constructing outcomes. Some studies reported only short data, or are pilot studies, limiting the generalisation of findings. In addition, the population characteristics, treatment fidelity processes, and cultural contexts make it difficult to evaluate comparisons and could add heterogeneity to the interpretation of outcomes. Further, the review was primarily restricted to behaviours and largely ignored structural determinants (e.g. poverty, stigma, policy barriers) that are often precursors to substance use and inconsistent with systematic reviews that focus on behavioural interventions. Finally, while corroborative studies were included to substantiate the review claims, these studies were not an exhaustive selection and therefore other relevant sources may have been missed entirely.

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