Effectiveness and critical features of remote therapies delivered as a component of drug and /or alcohol treatment:
a systematic review

Katy Sutcliffe, Helen Burchett, Wendy Macdowall, Irene Kwan, Preethy D'Souza, Claire Stansfield, Dylan Kneale and James Thomas

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PLAIN LANGUAGE SUMMARY

Why did we do this study?

Problems with drugs and alcohol can cause harms to people, their families and communities. Treating people and helping them to recover can lessen these harms.

Having treatment usually means meeting in-person with a health care provider in a clinic. These days, some treatment is provided over the telephone or on a computer. This is called 'remote therapy'. There are lots of different types of remote therapies, and they can be given either in addition to in-person treatment or instead of some, or all, of it.

What did we want to find out?

We wanted to find out if remote therapies are as good as, or better, than in-person treatment. We had three questions:

1. How well do remote therapies help to reduce drug/alcohol use?
2. What types of remote therapies work best at reducing drug/alcohol use?
3. Do remote therapies help some groups of people more than others?

What did we do?

We searched for studies that measured how well remote therapies did at reducing drug/alcohol use in adults who were having treatment. We used a checklist to work out the quality of the studies, and then we summarised their results. Next, we compared the group of studies that reduced drug/alcohol use the most with the group that reduced it the least, to find differences in what they did and how. Last, we looked at who had not been allowed to take part in the studies, and whether the remote therapies helped some groups of people more than others.

What did we find?

We initially found 49 studies plus five more when we updated our searches. The studies were different from each other in many ways: the types of remote therapy were not all the same; they were given at different treatment points; and what the remote therapy was compared to was different. Also, the remote therapy could be for people receiving treatment for drug use, for alcohol use, or for both.

How well do remote therapies help to reduce drug/alcohol use?

People who received remote therapy in addition to in-person treatment used drugs/alcohol on fewer days than those who only got in-person treatment and/or were less likely to start using drugs/alcohol again.

When remote therapies were given instead of in-person treatment, there was no clear difference in the number of days people used drugs/alcohol, but fewer people started using drugs/alcohol again.

What types of remote therapies work best at reducing drug/alcohol use?

The studies that reduced drug/alcohol use the most had three things in common. First, they met the treatment and recovery needs of people. This meant offering enough remote therapy and either motivating people to become or remain drug/alcohol free or offering remote therapy to those with more serious problems with drugs/alcohol. Second, they took a person-centred approach. This meant either designing the remote therapy for a specific group of people or responding to individuals' needs and preferences. Third, they supported service use. This meant that the remote therapy was designed to support continued participation in in-person treatment or encouraged the use of other available services. The studies which reduced drug/alcohol use the least did not have these features.

Do remote therapies help some groups of people more than others?

Almost all the studies did not let some people take part in the research. Most often this was people who had mental health problems and people who did not have access to technology. Very few studies looked at whether the remote therapy helped some groups of people more than others.

How sure are we about these findings?

We are unsure about these findings for four reasons. First, when we applied the checklist, we found problems with how most studies were carried out. Second, most of the studies took place in the USA, which is different to England in terms of how treatment is funded and delivered. Third, we do not know if remote therapies help some groups of people more than others. Fourth, some groups of people were left out of the studies (like those with mental health problems) so we don't know if remote therapies work for them at all.

What can we conclude?

When delivered *in addition to in-person treatment,* remote therapies can help to reduce the likelihood of using drugs/alcohol and the number of days of drug/alcohol use. When delivered *instead of in-person treatment,* the findings are less clear. We cannot say for sure if remote therapies are the same or better than in-person treatment.

Three features of remote therapies seem to be important: 1) meeting treatment and recovery needs, 2) taking a person-centred approach and 3) maximising service use.

How up to date is this evidence?

The evidence is up to date to August 2023.

SUMMARY

Background

In the UK, structured alcohol and drug treatment consists of a package of interventions which almost always includes psychosocial interventions and may contain pharmacological interventions and other services as appropriate. Recovery support covers a range of interventions that run alongside or after structured treatment and are designed to reinforce treatment gains.

Remotely-delivered treatment and recovery support interventions, for example services delivered by telephone, videoconferencing or computer (hereafter remote therapies) can be incorporated into drug or alcohol treatment packages in different ways. As was seen during the Covid-19 lockdowns, remote therapies can be used as a replacement for in-person treatment and recovery support components. However, they can also be used as a partial replacement for in-person treatment and recovery support components, or as an additional, adjunctive intervention. The timing of their use can also vary – being implemented parallel to (or instead of) new or ongoing in-person treatment and/or recovery support components, or when transitioning to a less intensive phase of treatment or recovery support.

What works to encourage retention in, and engagement with, treatment and/or recovery support, is not yet fully understood, nor whether remote therapies might enhance (or be able to replace) in-person components and in which circumstances. There is a clear need for a better understanding of which remote therapies, in which circumstances, may increase the likelihood of positive treatment and recovery support outcomes.

Aim and objectives

This systematic review sought to explore the effectiveness and critical features of remote therapies. The review comprised of three analyses to address the following questions:

1. How effective are interactive remote therapies for reducing drug/alcohol use?

2. Which intervention and implementation features of remote therapies are associated with greater reductions in drug/alcohol use?

3. Are changes in drug/alcohol use resulting from remote therapies consistent across different population groups?

Methods

We conducted systematic searching and screening to identify studies evaluating remote therapy interventions.

Analysis 1 – effectiveness: We conducted four effectiveness syntheses; we examined two outcomes (relapse and days of use) for each of two comparison types (remote therapy as a supplement to in-person care; and remote therapy as a replacement or partial replacement for in-person care components).

Analysis 2 – intervention characteristics: We used Intervention Component Analysis (ICA) and Qualitative Comparative Analysis (QCA) to explore which combinations of features were associated with the most and least effective remote therapy interventions.

Analysis 3 – population equity: We explored which population sub-groups were excluded from, and who participated in, the studies. We also sought to explore whether population characteristics were associated with the interventions' effectiveness.

To ensure these findings are as up-to-date as possible, we updated the initial search to August 2023 and conducted analyses to identify whether newly identified studies were consistent with, or changed, our original findings.

Findings

Characteristics of included studies

We identified 49 studies evaluating remote therapies in the initial search. The 49 studies, mostly RCTs (n=46) conducted in the USA (n=42), were heterogeneous in terms of:

- **Populations/substance use disorders targeted:** Alcohol (n=14), drugs (n=14) and mixed substances including alcohol (n=21).
- **Intervention types:** Self-guided therapy (i.e. structured learning and skill development programmes that are worked through independently) (n=24), remote recovery support (i.e. regular check-ins following a period of treatment to help maintain or reinforce treatment gains) (n=15), remote talking therapy (i.e. remotely delivered group or individual counselling sessions) (n=10) and 'other' (n=1) (an educational game) (note: total for intervention types is 50 since one of the 49 studies evaluated two types).
- **Intervention timing:** Interventions were delivered parallel to a new or ongoing in-person treatment phase (n=31), or when transitioning to a less intensive phase of in-person treatment or recovery support (n=18).

- **Comparisons:** Remote therapy as a *supplement to in-person care* was compared to in-person care alone (n=31) to examine whether the remote therapy group achieved better outcomes than controls. Remote therapy as a *replacement or partial replacement for components of in-person care* was compared to in-person care (n=18) to examine whether outcomes in the remote therapy group were not worse than controls.
- **Outcomes measured:** The most measured outcomes were days of use (n=29) or relapse (i.e. abstinence not maintained) (n=21) (Note: eight studies measured both outcomes). Four studies measured other outcomes only (e.g. drinks per drinking day) (n=4).

The search update in August 2023 identified a further five studies.

Analysis 1: How effective are interactive remote therapies for reducing drug/alcohol use?

Remote therapies as a supplement to in-person treatment and recovery support

Supplementing in-person care with remote therapy represents an effective approach for reducing the likelihood of relapse and days of drug/alcohol use. Among people who received remote therapy as a supplement to in-person treatment and/or recovery support the odds of relapse were 30% lower [n=15 interventions, n=1899 participants, OR 0.70 CI 0.57-0.86] and they had fewer days of use [n=14 interventions, n= 2,083 participants, SMD -0.20 CI -0.31,-0.09] compared to those who received in-person care alone. Sub-group analyses did not show any clear differences in impact with respect to intervention type, timing or substance target.

The update search identified additional studies which evaluated remote therapies as a supplement to treatment and/or recovery support, but pooled effect estimates were little changed for relapse [n=17 interventions, OR 0.61 CI 0.46-0.81] and days of use [n=17 interventions, SMD -0.18 CI -0.28,-0.08].

Remote therapies as a replacement or partial replacement for in-person treatment and recovery support

Replacing or partially replacing in-person treatment and/or recovery support components with remote therapy does not appear to lead to worse outcomes but the evidence is not conclusive. Among people for whom in-person components were replaced or partially replaced by remote therapy, the odds of relapse were 55% lower [n=4 interventions, n = 375 participants, OR 0.45 CI 0.24-0.84] and they had slightly fewer days of drug and/or alcohol use [n=8 interventions, n = 1828 participants, SMD -0.08 CI -0.24,0.07] compared to those who received exclusively in-person treatment and/or recovery support. Because the finding regarding relapse is based on limited evidence and the finding on days of use is not statistically significant, these do not provide conclusive evidence that remote therapies, as a replacement or partial replacement for in-person components, will achieve superior outcomes to in-person treatment and/or recovery support. The analyses on replacement/partial replacement contained too few studies to support sub-group analyses.

A single study from the update searches examined interventions as a replacement or partial replacement for in-person care; the study evaluated three interventions and measured relapse outcomes. The pooled effect estimate was little changed [n=7 interventions, OR 0.51 CI 0.34-0.76].

Limitations of the evidence base

There are several limitations to the evidence in terms of its robustness and relevance. The vast majority of studies across all four meta-analyses were at high risk of bias, only one was judged to be at low risk of bias. Further, the applicability of findings to

the English context is limited; no studies were from England or the UK and the interventions and populations within the included studies varied from those typically seen in the current English context.

Analysis 2: Which intervention and implementation features of remote therapies are associated with greater reductions in drug/alcohol use?

Whilst the meta-analysed findings for Analysis 1 show a positive effect overall, individual remote therapies in the meta-analyses included some with limited or harmful effects – i.e. they increased likelihood of relapse or number of days of drug/alcohol use. We conducted three Qualitative Comparative Analyses (QCA) of the most effective (n=8) and least effective remote therapies (n=5) to examine whether remote therapies reflecting different principles, as outlined in Table S1 below, are associated with greater effectiveness.

Table S1: Principles and conditions tested in the analysis of intervention and implementation features

QCA: Theoretical principle	Intervention and contextual conditions within each QCA		
QCA 1: Meeting treatment and recovery needs	a) Remote therapy offers an appropriate level of service	b) Remote therapy motivates abstinence	c) Remote therapy is delivered to those with higher severity drug/alcohol use disorder
QCA 2: Taking a person-centred approach	a) Remote therapy is targeted to meet the needs and preferences of a specific cultural group	b) Remote therapy offers opportunity to respond to individual needs and preferences	
QCA 3: Supporting service use	a) Remote therapy is designed to support engagement with in-person treatment and/or recovery support	b) Remote therapy motivates use of or engagement with other available services	

QCA 1, reflecting the principle of meeting treatment and recovery needs, identified that all most effective remote therapies (n=8) involved a combination of at least two of the three conditions; they all involved a) an appropriate level of service in addition to either b) motivating abstinence and/or c) being delivered to those with higher severity. By contrast, all least effective remote therapies (n=5) involved only a single condition either a) or c).

The findings for QCA 2 (taking a person-centred approach) and QCA 3 (supporting service use) are less consistent in their patterns of association. We found that all least effective remote therapies (n=5) lacked both relevant conditions in each of QCA 2 (a) targeting to meet cultural needs and b) responding to individual needs) and QCA 3 (a)

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supports engagement with in-person treatment and/or recovery support and b) motivates use of other services). Most of the most effective remote therapies (n=6) included one or both of the conditions in each QCA. However, two most effective remote therapies in each of QCA 2 and QCA 3 displayed the same configuration as the least effective remote therapies, in that they lacked both conditions; we identified possible explanations for these discrepant findings.

Overall, the QCA findings suggest that all three principles are important. Meeting treatment and recovery needs appears to be a necessary but not sufficient principle underpinning the most effective remote therapies; the most effective remote therapies also either took a person-centred approach and/or supported use of other services.

The update search identified one additional study categorised as most effective and two categorised as least effective, findings were broadly consistent with the original findings on intervention features.

Analysis 3: Are changes in drug/alcohol use resulting from remote therapies consistent across different population groups?

Almost all the studies (n = 44/49) had eligibility criteria with the potential to result in the exclusion of vulnerable sub-groups. The most notable eligibility criteria were those excluding people with mental health conditions (n=34) and those excluding people without access to digital technology (n=14). A lack of reporting on how many people were excluded because of these criteria makes it challenging to draw conclusions regarding the implications of such exclusions. Socio-demographic characteristics of the study populations were reported for all studies, though the characteristics and how they were measured varied. Age and gender were reported universally; ethnicity was reported in 42 of the 49 studies. Many characteristics, such as education, were reported in an inconsistent way across studies, whilst other characteristics, such as socio-economic status, were less commonly reported (n= 12 studies). Very few of the studies included in the meta-analyses for Analysis 1 (n = 4/29) reported whether there were differences in the effects of remote therapy according to equity characteristics; the few findings that were reported showed no clear patterns. We were unable to discern clear patterns of association between key equity characteristics and most and least effectiveness using QCA.

The inclusion of additional studies from the update did not substantially change the original population equity findings.

Conclusion

Remote therapies can be an effective approach to reducing the likelihood of relapse and days of drug and alcohol use, when offered as a supplement to in-person treatment and/or recovery support. The evidence on replacing or partially replacing in-person treatment and/or recovery support components with remote therapies is not conclusive, but it does not appear to lead to worse outcomes. There are limitations to the evidence in terms of robustness and relevance to the English context; most trials were found to be at high risk of bias, none were from the UK and many interventions and populations varied from those typically seen in the English context.

Three key principles appear to distinguish between the most and least effective remote therapies: 1) meeting treatment and recovery needs, 2) taking a person-centred approach and 3) maximising service use. For remote therapies to be most effective it appears to be essential that they meet treatment and recovery needs, but to increase the likelihood of successful outcomes they should also take a person-centred approach and/or maximise service use.

Almost all studies had eligibility criteria that excluded potentially vulnerable groups. Participants' socio-demographic characteristics were widely reported, but not in a standardised way that would enable comparison. Very few studies explored outcomes according to key population equity characteristics and we were unable to discern association between the effectiveness of remote therapies and key equity characteristics using QCA. As such, there remain gaps in knowledge relating to vulnerable groups and the differential impact of remote therapies for different groups.

Abbreviations

AUD	Alcohol use disorder
CBT	Cognitive behavioural therapy
CI	Confidence interval
CM	Contingency management
CRA	Community reinforcement approach
DAUD	Drug/alcohol use disorder
DSM	Diagnostic and Statistical Manual
IP	Inpatient treatment
IOP	Intensive outpatient treatment
MET	Motivational enhancement therapy
nRCT	Non-randomised controlled trial
OECD	Organisation for Economic Cooperation and Development
OP	Outpatient treatment
RCT	Randomised controlled trial
ROB	Risk of bias
SUD	Substance use disorder
TAU	Treatment as usual
QCA	Qualitative Comparative Analysis

1 BACKGROUND

1.1 Problem drug and alcohol use in the UK

Alcohol and drug use are important public health issues in the UK. Alcohol use is the biggest risk factor for death, ill-health and disability among 15-49 year olds in the UK (Office for Health Improvement and Disparities, 2024). Drug use also has negative health and social outcomes; in 2022 drug misuse deaths in England and Wales increased to their highest recorded level (Office for National Statistics, 2023).

1.2 Drug and alcohol treatment

There are a range of interventions that can be used for problem alcohol and drug use, including those aiming at prevention, early intervention activities targeting those who may be at risk of dependence, as well as those treating people with alcohol or drug dependence (Burchett et al., 2022). Treatment for and recovery from drug and alcohol dependence is a key aspect of the UK government's approach to tackling problem drug and alcohol use and reducing harms (Department of Health and Social Care, 2021). Drug treatment in England is protective against premature mortality and there is strong and consistent evidence that fatal drug-related poisoning is approximately halved during time people spent in treatment compared to time outside treatment (Burkinshaw et al., 2017). Similarly, treatment for alcohol dependence is effective and cost-effective at reducing alcohol consumption and dependence (OECD, 2021). Results from OECD modelling indicate that alcohol treatment has a positive impact on population health by contributing to gains for both Disability-Adjusted Life Years (DALYs) and, to a lesser extent, Life Years, measuring morbidity and life expectancy respectively.

In the UK, structured alcohol and drug treatment consists of a comprehensive package of specialist interventions which includes an assessment of needs and a clear recovery care plan, with goal setting and regular reviews (Public Health England, 2020). The package may contain pharmacological interventions, psychosocial interventions and other services as appropriate. Recovery support covers a range of interventions that can be delivered alongside or after structured treatment and are designed to reinforce treatment gains (Public Health England, 2020). Treatment and recovery support can be provided from community-based drug and alcohol services, specialist outpatient or inpatient services, residential rehabilitation centres and GP surgeries by specialist competent staff, working within appropriate supervision and clinical governance structures.

Almost all those receiving drug/alcohol treatment in England receive psychosocial interventions (Office for Health Improvement and Disparities, 2023a). Among those receiving treatment for opiate use, almost all receive pharmacological treatment as

well, whereas only a minority of those treated for non-opiate or alcohol use receive pharmacological treatment (ibid).

Just under half of people (46%) leaving drug and/or alcohol treatment in England in 2022/23 did so because they completed treatment free from dependence (Office for Health Improvement and Disparities, 2023a). Rates of completing treatment dependence-free were highest among those treated for alcohol use (58%) and lowest for those treated for opiates alone (23%). What works to encourage retention in, and engagement with, treatment and recovery support, is not yet fully understood, nor which remote therapies, in which circumstances, might enhance (or be able to replace) components of standard in-person treatment and recovery support.

1.3 The impact of the Covid-19 pandemic on drug and alcohol use and treatment

Evidence indicates that alcohol use increased during the Covid-19 pandemic (Daly & Robinson, 2021), although some people drank less (Winstock et al., 2020). The Global Drug Survey indicates that whilst overall some drug use declined during lockdown (notably those typically used more socially e.g. cocaine and ecstasy), this varied with some people using more frequently or not changing their habits (Winstock et al., 2020). More people reported increasing their use of cannabis and methamphetamine than decreasing it. Despite the disruption caused by Covid-19, the number of adults in drug/alcohol treatment increased slightly in recent years (Office for Health Improvement and Disparities, 2023a). Nearly half of these are treated for opiate use and over one quarter for alcohol use (ibid).

During lockdown, services switched to remote delivery to continue providing treatment and recovery support. Since then, most services have returned to in-person delivery, however some effects of the pandemic on services have persisted (Office for Health Improvement and Disparities, 2022). While it is expected that treatment should include an in-person element, the continued potential benefits of remote therapies as part of treatment have been recognised (ibid). Nevertheless, such benefits cannot be automatically assumed. During the pandemic, deaths of people in drug/alcohol treatment increased and have remained higher than previous figures since lockdown ended (Office for Health Improvement and Disparities, 2023a).

There is therefore a clear need for a better understanding of which remote therapies, in which circumstances, may increase the likelihood of positive drug/alcohol treatment and recovery outcomes.

1.4 Remote drug/alcohol therapy interventions

For this report, we define remote therapies as therapeutic interventions delivered either online, by telephone or through a mobile application that are provided as part of

treatment for drug and/or alcohol dependence. They may be delivered parallel to a new or ongoing in-person treatment phase, or when transitioning to a less intensive phase of treatment or recovery support. Remote therapies involve various types of non-pharmacological support using tailored interaction, with or without therapist involvement. They support people to build commitment, motivation and belief in their capacity to reduce or stop their drug/alcohol consumption and to develop a range of cognitive and behavioural skills and techniques to reach their personal goals.

Remote therapy interventions can be incorporated into drug treatment and recovery packages in different ways. As was seen during the Covid-19 lockdowns, they could be used as a replacement for in-person services. However, they could also be used as a partial replacement for in-person treatment and recovery support, or as an additional, adjunctive intervention. The timing of their use can also vary – being implemented parallel to a new or ongoing in-person treatment phase, or when transitioning to a less intensive phase of treatment or recovery support.

There are several potential advantages and disadvantages to using remote therapy interventions within drug and alcohol treatment. Remote therapies could help overcome some key patient-related challenges to accessing treatment and recovery support, such as stigma, and may be more convenient (Garnett et al., 2018). There is, however, concern that faced with the service-delivery challenges of time constraints, lack of training and inadequate resources including funding (Nair et al., 2015), services may use remote therapies to replace or partially replace in-person treatment and recovery support components for cost-saving purposes rather than to optimise patient outcomes. It has been recognised that funding has been squeezed in recent years and there is a pressing need to build capacity and expertise (Black, 2020).

1.5 Existing evidence on remote drug and alcohol treatment interventions

A comprehensive evidence map on digital interventions for alcohol and drug prevention, treatment and recovery identified 1,250 primary studies and 18 recent systematic reviews (Burchett et al., 2022). The aim of the map was to understand the extent and nature of evidence on harnessing new technology in the delivery of alcohol or drug interventions (it therefore did not include telephone or other non-digital remote interventions).

Despite the sizeable evidence base, the map revealed that a minority of primary studies focused on treatment and recovery interventions. Among the primary studies the predominant focus was on prevention and early intervention (n=932); with much less focus on treatment and recovery (n=220) or sustaining recovery (n=90). In addition, the map revealed a dearth of review-level evidence on treatment interventions published since 2014. All 18 systematic reviews that were included, focused on prevention and early intervention with just one moderate quality review

(Boumparis et al., 2017) also focusing on treatment and recovery. Alongside a focus on prevention, that review (ibid) included a meta-analysis of six primary studies specifically evaluating digital treatment interventions (community reinforcement and contingency management) that showed a small but significant decrease in drug use (n=6 studies; n=participants not stated; pooled effect size (g) = 0.39; 95% CI = 0.26 to 0.52; P≤0.001). Nevertheless, the map revealed a significant opportunity to augment the evidence-base by examining in more detail the substantial pool of primary studies on treatment and recovery (n=220). In addition, while the original map aimed to understand how best to harness interactive digital or novel technologies in the service of addressing problem drug and alcohol use, the COVID-19 pandemic highlighted the need to consider all approaches for remote delivery of services, including older technologies that enable interaction, monitoring and feedback, such as telephones. Given the transition to remote delivery of therapy as a component of structured drug/alcohol treatment and recovery support during the pandemic, addressing these evidence gaps may provide vital information to support current service delivery. Clarity on which remote therapies are effective when delivered as part of structured treatment and recovery support will inform service providers on how best to 'blend' in-person and remote approaches beyond the pandemic.

Recent evidence from the UK has shown that one of the key challenges of providing remotely delivered interventions for problem drug and alcohol use is encouraging people to maintain engagement with remote support over time (Elison-Davies et al., 2021; Taak et al., 2021). Therapies with a remotely-delivered interactive element that are delivered as a component of treatment and recovery support, hereafter 'remote therapies', could help to encourage engagement with and retention, as well as helping to achieve positive outcomes. Thus identifying which remote therapies are effective may help service providers in commissioning or delivering remote services that engage and retain people in treatment and recovery support. In addition, there is a need to understand how and why remote therapies engage and are of benefit, as well as whether remote therapies are effective for reducing drug and alcohol use among disadvantaged population groups such as women and ethnic minority groups.

2   BRIEF AIMS AND METHODS

This chapter provides a brief overview of the methods used in each stage. A more detailed account of the methods is provided in section 5.

2.1   Aims and research questions

This systematic review sought to explore the effectiveness and critical features of remote therapies. The review addressed the following research questions:

1: How effective are remote therapies for reducing drug/alcohol use?

2: Which intervention and implementation features of remote therapies are associated with greater reductions in drug/alcohol use?

3: Are changes in drug/alcohol use resulting from remote therapies consistent across different population groups?

2.2   Overview of methods

The review had three stages, corresponding to each of the research questions, which are described in figure 1.

Figure 1: Overview of review structure

Analysis 1: Intervention effectiveness
- **Question:** _How effective_ are remote therapies for reducing days of drug/alcohol use, or rates of relapse?
- **Evidence:** Outcome evaluations
- **Method:** Statistical meta-analysis and narrative synthesis

Analysis 2: Intervention features
- **Question:** Which _intervention and implementation features_ of remote therapies are associated with greater effectiveness?
- **Evidence:** Outcome evaluations and process evaluations
- **Method:** Qualitative comparative analysis

Analysis 3: Population equity
- **Question:** Are the changes in drug/alcohol use resulting from remote therapies consistent _across different population groups_?
- **Evidence:** Outcome evaluations and process evaluations
- **Method:** Analysis of exclusion criteria and study populations, analysis of reported differential outcomes, qualitative comparative analysis

2.3 Stakeholder engagement

The preliminary stage of this review involved developing an interactive map for which we convened an advisory group, comprising of experts from relevant academic disciplines and practice sectors (Burchett et al., 2022). The focus of this in-depth review was determined in consultation with policy stakeholders at the Office for Health Improvement and Disparities (OHID). There was no public involvement in the project but extensive dialogue with OHID at key stages during the review ensured that it was tailored to policy-maker needs.

2.4 Inclusion criteria

The inclusion criteria are summarised in Table 1. A full account of the criteria, and notes on their operationalisation, are provided in section 5.5.

Table 1: Criteria for inclusion and exclusion of studies

	To be included, studies had to focus on:
Participants	Adults receiving treatment for drug or alcohol dependence.
Intervention	Interventions that are delivered remotely or digitally (i.e. online, by telephone or through a mobile smartphone app), alongside, or as a component of in-person treatment and/or recovery support for drug and/or alcohol dependence, are interactive and which support people to build commitment, motivation and develop a range skills for reducing drug and alcohol use.
Comparison	Any type of comparator including in-person treatment and/or recovery support, no intervention, or an alternative remote intervention.
Study designs	Any outcome evaluation with a comparison group: randomised controlled trials (RCTs), non-randomised controlled trials (nRCTs) or controlled before-and-after studies.

		Any type of process evaluation of a specific intervention (for Analysis 2 & 3 only).
	Measures	Any quantitative outcome measures of drug/alcohol consumption (e.g. self-reported units per week/drinking days, days abstinent, time to relapse, etc.) or any process measures (for Analysis 2 and Analysis 3 only).
	Geographical location	OECD countries
	Date	Published in or after 2004
	Language	English language

2.5 Information sources and search strategy

Literature was identified from an earlier evidence map, whose search was updated to end of June 2021. Additional searches of over 20 bibliographic databases and other online resources were also undertaken during November and December 2021 and further updated to August 2023. Full details of the databases and resources searched are provided in section 5. An example search strategy is provided in Appendix 2. An overview of the 2023 update search is provided in section 2.13 below, and the full methods and results are provided in Appendix 5.

2.6 Study selection

Following duplicate removal, search results were imported into the systematic review software, EPPI-Reviewer (Thomas et al., 2020).

Titles and abstracts were screened against the inclusion criteria. A sample of records was screened by at least two reviewers independently and differences resolved by discussion. Once agreement rates were adequate (>90%), records were screened by a single reviewer. We used a machine classifier to prioritise screening and automatically excluded records of very low relevance (Stansfield et al., 2022; Thomas et al., 2020).

Full reports were obtained for those papers judged as meeting the inclusion criteria, or where there was insufficient information to assess relevance. Full reports were all screened by at least two reviewers working independently. Disagreements were resolved through consensus.

The subsequent work focused primarily on the set of outcome evaluation studies (hereafter referred to as the 'studies'), to answer the research questions related to effectiveness (Analysis 1). Process evaluations were used, where relevant, for Analyses

2 and 3. In some instances, studies were reported in multiple papers. To avoid double counting, we identified one paper as the 'main' outcome evaluation findings paper and identified which other papers were 'linked' to it.

2.7   Data extraction

Key descriptive information was extracted from all included outcome evaluation studies using coding tools developed for this review, covering information about the study design, intervention characteristics, population, context and outcomes.

Because studies did not use consistent terminology and there was wide variation in content, frequency and intensity of interventions, we grouped them into three broad 'types' of intervention based on the nature of what was provided (remote recovery support, remote talking therapy or self-guided therapy); see table 2 for definitions of these categories.

The interventions were also grouped according to their timing in relation to in-person treatment (parallel to a new or ongoing in-person treatment phase, or when transitioning to a less intensive phase of treatment or recovery support, hereafter 'parallel' or 'transitioning' interventions).

'Transitioning' interventions were typically delivered following discharge from in-patient treatment or intensive outpatient treatment to less intensive outpatient treatment. Although they were often described as either 'aftercare' or 'continuing care' their extent and intensity could be similar or even greater than 'parallel' interventions, reflecting the 'blurred line' between treatment, continuing care and recovery support provision and differences between the UK and other countries (Office for Health Improvement and Disparities, 2023b). See definitions in table 2.

Separate categories for type and timing were used because intervention content, approach, and/or intensity were not consistent with respect to timing. For example, interventions classed as 'remote talking therapy' could be delivered parallel to new or ongoing in-person treatment or when transitioning to a less intensive phase of treatment or recovery support. The tools were piloted to ensure consistency and clarity. Full details of these tools can be found in section 5.8. Data was extracted by two reviewers independently and differences resolved by discussion or consulting a third reviewer.

Table 2: Definitions of types and timing of remote therapy

Type of remote therapy	
Remote recovery support	A range of interventions that are delivered in parallel to a new or ongoing treatment phase or when transitioning to a less intensive treatment or recovery support phase, to reinforce gains made in treatment. These interventions aimed to check up on recovery progress, maintain or improve motivation, support recovery goals, identify risks of or actual relapse and/or facilitate access to treatment or other recovery services if required.
Remote talking therapy	Remote, synchronous group or individual counselling sessions, typically based on cognitive, behavioural, psychological, psychodynamic or 12-step interventions and delivered by a trained, qualified therapist or counsellor. For example, counsellors might "develop the service user's abilities to recognise, avoid or cope with thoughts, feelings and situations that are triggers to substance use" (p66) (Public Health England, 2019), reflect on drug and/or alcohol use behaviours and motivations, progress made and strategies to apply, and/or develop and practice skills to support drug refusal and preventing relapse.
Self-guided therapy	A structured programme containing different activities that people work through themselves, such as self-monitoring, information learning and skill development. People may work through modules of activities in their own chosen order, or their order may be recommended by a provider. They may be fully automated or may be delivered with input from a provider and may or may not be based on a particular approach or therapy, e.g. cognitive behavioural therapy.
Timing of intervention	
Parallel to a new or ongoing in-person treatment phase	Participants receive remote therapy parallel to a new or ongoing in- or outpatient treatment phase for alcohol or drug dependency. This type of intervention aims to enhance the benefits of, and support engagement with, in-person treatment.
When transitioning to a less intensive phase of treatment or recovery support	Participants receive remote therapy when transitioning to a less intensive phase of treatment or recovery support, for example following discharge from in-patient treatment or intensive outpatient treatment to less intensive outpatient treatment. This type of intervention aims to maintain the gains of the earlier phase of treatment.

2.8   Analysis 1: intervention effectiveness

2.8.1   Selecting and extracting outcomes

As described in section 2.4, included studies could report any type of outcome measure relating to drug/alcohol consumption. To synthesise the maximum number of studies we identified which outcome measures were most commonly reported; these were relapse (i.e. abstinence not maintained over a specified period) and days of use (i.e. the number of days on which drugs or alcohol were consumed during a specified period). Only studies reporting at least one of these two outcomes were included in Analysis 1. We found that most studies measured outcomes at the end of the intervention and that relatively few reported follow-up data after the end of the intervention. For comparability we extracted outcomes at the end of the intervention, or at the closest time point to the end of the intervention where end of intervention outcomes were not reported.

2.8.2   Risk of bias assessment

Outcome evaluations were assessed for risk of bias, specific to the outcomes included in the effectiveness syntheses, using the Cochrane RoB 2 (Sterne et al., 2019). All assessments were conducted by at least two reviewers with differences resolved by discussion or consulting a third reviewer.

2.8.3   Data synthesis

We conducted four effectiveness syntheses, reflecting the two selected outcomes and the two types of analysis conducted by the studies.

Outcomes: We synthesised evidence on the two most reported outcomes; relapse and days of use.

Type of analysis: Due to variation in terms of comparisons i.e. what the intervention group received and what it was being compared to, syntheses were also organised according to the two analysis types employed by the studies. Some studies examined whether providing remote therapies as a supplement to in-person treatment and/or recovery support was more effective than providing in-person care alone. Other studies examined whether remote therapies, as a replacement or partial replacement for in-person care components, were no less effective than exclusively in-person care. The former analysis is akin to the idea of a 'superiority' analysis in which the intervention is assumed to be superior to the comparator; the latter analysis is akin to a 'non-inferiority' analysis in which the intervention is assumed to be no less effective than the comparator. We describe the studies as being 'akin' to superiority and inferiority analyses as this appeared to be their aim; however, the trials were not necessarily designed or statistically powered to test superiority or non-inferiority hypotheses and there was no set threshold for what non-inferiority would look like from the outset. Analyses were conducted in R software, by DK.

Table 3 below illustrates the nature of the four syntheses.

Table 3: Details of the four syntheses

Synthesis	Analysis type	Assumption	Intervention	Comparator	Outcome
1	Akin to superiority	Supplementing in-person treatment and/or recovery support with remote therapy will enhance its effectiveness	Standard in-person treatment and/or recovery support + remote therapy	Standard in-person treatment and/or recovery support	Relapse
2					Days of use
3	Akin to non-inferiority	When provided as an _alternative or partial alternative_ to in-person treatment and/or recovery support components _remote therapy will be no less effective_	remote therapy OR remote therapy + partial standard in-person treatment and/or recovery support	Standard in-person treatment and/or recovery support	Relapse
4					Days of use

For each effectiveness synthesis we conducted a statistical meta-analysis of all relevant studies with suitable data (see section 5.8 for more details). We also report on the findings of studies with relevant outcomes for the synthesis, but with data that was not amenable to meta-analysis, e.g. studies which reported means without providing the standard deviation.

For meta-analyses with enough trials, we conducted sub-group analyses to explore whether outcomes varied according to all three key dimensions of difference: intervention type, substance type targeted and intervention timing. Since we were unable to anticipate the kinds of variation we would encounter in terms of intervention type and timing, these sub-group analyses were not pre-specified in the protocol.

2.9   Analysis 2: intervention features

Analysis 2 followed the key stages of qualitative comparative analysis (QCA) as outlined by (Thomas et al., 2014).

2.9.1 Selecting most and least effective remote therapies

Using the outcome data from Analysis 1 we selected the most and least effective remote therapies. Most effective cases were those with statistically significant positive effects. Least effective cases were those showing outcomes equivalent to or worse than controls.

2.9.2 Data extraction

Data was extracted from outcome evaluations and linked process evaluations on the type, timing, features and implementation of interventions. An inductive process of data extraction was used, following the Intervention Component Analysis (ICA) approach (Sutcliffe et al., 2015). Data was extracted by one reviewer (HB or KS) and checked for accuracy by another (HB or KS).

2.9.3 Data analysis

We explored whether particular combinations or 'configurations' of conditions were aligned with most or least effective remote therapies. We constructed Truth Tables (the key analytic device in QCA) to systematically examine the consistency of association between configurations of conditions reflecting broad theoretical principles and outcomes. We used Boolean minimisation to identify the simplest solutions that best fit the data and interpreted these solutions in terms of consistency and coverage, and in terms of their coherence with the theory and cases. We also produced a consolidated QCA to examine the relationship between each of the broad principles reflected in the QCAs 1-3. Analyses were conducted by DK in R software, using the software package *QCA* (Dusa, 2019).

2.10 Analysis 3: population equity

Analysis 3 aimed to explore if changes in drug/alcohol use resulting from remote therapies were consistent across different population groups. We adopted four strategies to examine this. First, we sought to understand if certain disadvantaged groups were excluded from participation in the included studies by investigating the exclusion criteria employed by the studies. Second, we sought to understand whether disadvantaged groups were under-represented in the studies, by examining the population characteristics that were reported by each study. Third, we explored whether drug and alcohol use outcomes were reported according to key population equity characteristics, and if so whether there was any variation. Finally, we sought to examine whether patterns of equity-relevant characteristics were associated with most and least effective remote therapies using QCA.

2.10.1 Data extraction

To extract data on the criteria used to exclude participants from the included studies we developed a bespoke tool. Following preliminary assessment of the tool on five

studies, it was then tested on a further five. The exclusion criteria were then coded by two members of the team (WM and PD) and agreement reached.

To examine potential underrepresentation of disadvantaged groups in the included studies, we extracted equity-relevant characteristics of the populations reported in each of the studies using the PROGRESS-Plus framework. PROGRESS-Plus is an acronym of the axes of potential disadvantage which includes: Place of residence, Race/ethnicity, Occupation, Gender/sex, Religion, Education, Socio-economic status and Social capital. The 'plus' refers to additional categories such as age, sexual orientation and disability (Kavanagh et al., 2008). For this review we interpreted the plus as also including digital and substance use related characteristics. Data was extracted into Excel by two members of the team (WM and PD).

To examine whether outcomes varied for different population groups we identified whether studies reported sub-group analyses of key population equity characteristics (gender, age, ethnicity and mental health conditions) in relation to relapse and days of use outcome measures, for those studies that had been included in the meta-analyses in Analysis 1. Where available, we extracted authors' descriptions of these findings.

To examine patterns of population equity in relation to most and least effective remote therapies we extracted data on gender, age and ethnicity for the populations in the studies included in Analysis 2.

2.10.2 Data Analysis

We examined data on the characteristics of study participants, as well as study exclusion criteria to identify the types of people that remote therapies have, and have not, been evaluated with. We then examined whether sub-group analysis findings reported by authors demonstrated consistent patterns of associations between key population equity characteristics and outcomes.

Finally, we assessed whether gender, age and ethnicity were aligned with either the most or least effective remote therapies using QCA.

2.11 Ethics

Ethical approval was obtained from the UCL Institute of Education Ethics Committee using their expedited procedures for systematic reviews.

2.12 Deviation from protocol

In the protocol, we planned to focus on all outcomes relating to reducing drug/alcohol use. Upon familiarising ourselves with the outcomes measured in the included studies, we synthesised evidence on the two most reported outcomes: relapse or days of drug/alcohol use, to support synthesis across the maximum number of studies. We have therefore not considered the interventions' effect on other outcomes such as

reducing the quantity of drugs and alcohol consumed, or the percentage of risky or high use days.

In the protocol, we planned to critically appraise all included study designs. Upon completion of screening, we decided not to critically appraise the non-randomised trials, since there were so few of them. We also did not critically appraise process evaluations or qualitative data, since there were so few studies that could be considered discrete process evaluations (most were outcome evaluations that collected and reported some process data).

We had not planned any specific subgroup analyses since we were unclear about the range of interventions we would identify. However, once we understood the nature of the interventions, but before conducting the meta-analysis, we agreed to conduct sub-group analyses to explore whether there was variation in effectiveness between the different types of remote therapies and between different types of drug and alcohol use.

2.13 2023 search update

Given the scope and complexity of this review, the time to complete the work following the initial searches 2021 meant that the findings may have been out of date (Stokes et al., 2022). An update search was conducted in July and August 2023 to see if more recent evidence was available, and if so, whether that evidence would change the conclusions of the original review. In line with reporting guidance for living reviews, (Khabsa et al., 2023) we have opted to report the update in a separate appendix. Our report focuses on the changes between versions. This approach, compared to fully integrating the results, avoids the time-consuming requirements of fully integrating the update into the report which could potentially defeat the purpose of the update. Appendix 5 includes update search methods, the results of screening, study characteristics and risk of bias assessments. Also documented are the outcomes of newly included studies and their impact on the analysis of intervention effects (Analysis 1), findings in relation to intervention features (Analysis 2) and details in relation to population equity (Analysis 3).

3 RESULTS

3.1 Overview of the studies

3.1.1 Summary of studies included in the review

- We identified 49 studies evaluating remote therapies
- Almost all studies were RCTs (n=46), rather than non-randomised trials
- Studies were mainly conducted in the USA (n=42); no UK-based studies were identified
- Half evaluated self-guided therapies (n=24), almost a third evaluated remote recovery support interventions (n=15), a fifth evaluated remote talking therapies (n=10)
- Almost half the remote therapy studies were delivered parallel to a new or ongoing in-person treatment phase (n=31); rather than when transitioning to less intensive treatment or recovery support (n=18).

3.1.2 Flow of studies through the review

Systematic searches in 2021 identified 15,892 references for screening. Priority screening excluded 6,047 references that were likely to be of low relevance. The remainder were screened manually on title and abstract and the full text of 876 references were then screened. This resulted in the identification of 186 references for inclusion within the review. Of these, 49 were outcome evaluation studies, 92 were process-only evaluations (i.e. contained no assessment of the interventions' effect on consumption outcomes). The remaining 45 were linked to the 49 included outcome evaluations: for example, papers reporting follow-up data. The remainder of this chapter focuses on these 49 outcome evaluations; methods and findings of the update search in 2023 are reported in Appendix 5.

For the effectiveness synthesis (Analysis 1) we were able to include 29 studies in meta-analyses and 13 in narrative synthesis (see section 3.2 for details). We did not synthesise the findings of four studies that did not report usable data on our outcomes of interest, and a further three that were the only non-randomised studies. For the analysis of intervention features (Analysis 2), we compared the features of the most effective remote therapies (n=8) to the least effective remote therapies (n=5) (see section 3.3 for details). For the population equity analysis (Analysis 3) we examined the population characteristics and inclusion criteria of all 49 studies (see section 3.4 for details). For the differential outcomes analysis (Analysis 3) we focused on the 29 studies included in the meta-analysis. For the association of equity characteristics with most and least effectiveness (Analysis 3) we focused on the 13 studies included in Analysis 2. Figure 2 below illustrates the flow of studies through the review. Figure 3 illustrates the selection of studies for each analysis.

Figure 2: PRISMA flow diagram of studies through the review

Identification of studies via databases and registers

Identification

Records identified from:

Evidence map (n = 374)

Update searches (n = 8,414)

Additional searches from expanded scope (n = 12,074)

Manual addition June 22 (n = 4)

Total (n = 20,866)

→ Duplicate records removed before screening (n = 4,974)

Screening

Records screened (n = 15,892)

→ Records excluded:

By priority screening (n=6,047)

Manually (8,954)

Records sought for retrieval (n = 891)

→ Records not retrieved (n = 15)

Eligibility

Full-text articles assessed for eligibility (n = 876)

→ Articles excluded:

Duplicates (n = 33)

On topic (n = 23)

On intervention delivery (not interactive remote) (n = 44)

On intervention (n = 87)

On target group (n = 203)

On study design (n = 128)

On outcome/process measures (n = 24)

Non-English (n = 1)

Non-OECD (n = 13)

On publication date (n = 2)

Remote therapy is only intervention received (no standard care) and compared to a 'no intervention' control (n = 7)

On publication type (n = 125)

Total excluded (n = 690)

Included

Studies included (n = 186)

Main studies reporting unique outcome evaluations (n = 49)

Studies included in meta-analyses (n = 29)

Process-only evaluations (n = 92)

Articles linked to an included outcome evaluation (n = 45)

Figure 3: Studies included in each analysis

Outcome evaluations meeting inclusion criteria (n=49)

Analysis 1: Effectiveness

Total studies included (n=42):

Meta-analysis (n=29)

Narrative synthesis (n=13)

Excluded from this synthesis (n=7):

Non-randomized studies (n=3)

No usable data (n=4)

Analysis 2: Intervention features

Total studies included (n=13):

Most effective remote therapies (n=8)

Least effective remote therapies (n=5)

Excluded from this synthesis (n=36):

Moderately effective remote therapies (n=16)

Studies not in meta-analysis (n=20)

Analysis 3: Population equity

Total studies included (n=49)

Exclusion criteria analysis (n=49)

Population characteristics analysis (n=49)

Differential impacts analysis (n=29)

Population features QCA (n=13)

Excluded from c) and d):

c) studies not in meta-analysis (n=20)

d) studies not in intervention features synthesis (n=36)

3.1.3 Characteristics of the included studies (n = 49)

The descriptive characteristics of the included studies are summarised in table 4. An overview of each of the included studies is presented in Appendix 1.

Table 4: Summary of characteristics of included studies

Characteristics of studies (n=49)	No. of studies
Country where studies conducted	
USA	43
Germany	2
Mexico	1
Switzerland	1
Ireland	1
Sweden	1
Study Design	
RCT	46
Non-RCT	3
Sample size	
Small (n <30)	4
Medium (n ≥30 but <100)	21
Large (n ≥100)	24
Primary substance targeted by intervention	
Alcohol	14
Drugs	14
Mixed substances including alcohol	21
Timing of remote therapies	
Parallel to a new or ongoing treatment phase	31
When transitioning to a less intensive phase of treatment or recovery support	18
Type of remote therapy*	
Remote recovery support	15
Remote talking therapy	10
Self-guided therapy	24
Other	1

Characteristics of studies (n=49)	No. of studies
Mode of remote interaction (not mutually exclusive)	
Online computer	21
Telephone calls (voice)	10
Text message	4
Interactive voice recognition (IVR)	3
Mobile phone apps	3
Video-conferencing	2
Multi-modal	5
Video-games	1
Overall risk of bias assessments (n=42 studies; n=50 outcomes assessed)	
High	35
Some concerns	13
Low	2

*adds up to more than 49, since one study evaluated multiple interventions which were different types of remote therapy

Publication date

The majority of the 49 included studies were published during or after 2014, likely reflecting increased research interest in the potential benefits of internet-enabled technologies, given the increased opportunities created by the advancements of mobile web-based and digital technologies emerging then ('Web 2.0').

Country of publication

The evidence was dominated by studies conducted in the USA (n=43). Remaining studies were published in Germany (n=2), Switzerland, Ireland, Mexico and Sweden. No UK-based studies were identified.

Study size

The studies ranged in size from just 14 participants (Brooks et al. 2010) to 667 participants (McKellar et al. 2012). Approximately half of the studies (n=24) involved more than 100 participants; of these, 17 involved more than 200 participants. A large proportion (n=21) involved more than 30 participants but fewer than 100. Four studies involved fewer than 30 participants. Four of the studies with between 30 and 100

participants, and 10 of the studies with more than 100 participants were multi-arm trials.

Population focus

The 8,592 study participants were predominantly male. Specific groups of participants included people with co-occurring mental health problems (n=3), veterans (n=2), liver transplant candidates (n=1) and prison inmates (n=1). A detailed analysis of the population focus of studies is provided in section 3.4.

Substance use targets

Approximately one third of the interventions targeted alcohol use (n=14). Drugs were the target of 15 interventions; opioids (n=6), cocaine (n=3); cannabis (n=2), methamphetamine (n=1) and mixed/unspecified drugs (n=3). The remaining 20 interventions targeted a 'mixed' group of people using alcohol and/or drugs.

Types of remote therapies

The most common type of intervention was self-guided therapy (n = 24), followed by remote recovery support (n = 15) and remote talking therapy (n = 10).

The self-guided therapies were mostly based (wholly or partially) on cognitive-behavioural therapy (e.g. CBT4CBT) and were often completed on computers within treatment clinics. Only one was delivered through smartphones (DeFulio et al., 2021).

Remote recovery support interventions typically used text messages or telephone calls to monitor participants who had completed a period of treatment, in terms of consumption and/or adherence to ongoing treatment activities.

The remote talking therapies were delivered by trained counsellors but most (n=13) were relatively brief telephone calls (30 minutes or less), and included monitoring, feedback, encouragement and/or some counselling. Three were longer sessions of 1-2 hours of online individual or group counselling.

Timing of remote therapies

From the studies identified, remote therapies were introduced at different stages in the patient's care pathway (see table 5), reported as follows:

- Remote therapy delivered *parallel to* a new or ongoing treatment phase (n=31).
- Remote therapy delivered when transitioning to a less intensive phase of treatment or recovery support (n=18).

Table 5: Types of remote therapies by timing

Type of remote therapy	Remote recovery support (n=15)	Remote talking therapy (n=10)	Self-guided therapy (n=24)	Other [†] (n=1)
Remote therapy delivered parallel to new or ongoing treatment phase (n=31)	4	3	23	1
Remote therapy delivered when transitioning to a less intensive period of treatment or recovery support (n=19*)	11	7	1	0

* One study (Graser et al., 2021) evaluated three interventions, two of which were remote talking therapy, and one was remote recovery support. This study is therefore represented in the counts for both remote talking therapy and remote recovery support, adding the total values to 50 rather than 49.

† Computer simulation game

Providers/delivery medium of remote therapies

The remote therapies were delivered by a variety of qualified clinical or trained staff, technical staff and/or web-based automated computer technology (see table 6).

Table 6: Types of remote therapies by providers

Type of remote therapies / provider	Remote recovery support	Remote talking therapy	Self-guided Therapy	Other	Total
Qualified / certified therapist	1	9	0	0	10
Staff trained to deliver interventions	3	1	0	0	4
Fully automated / self-study with no interaction with a provider aside from technical support	5	0	16	0	21
Partially automated / self-study with support from staff offering monitoring / therapy	5	0	9	0	14
Other (simulation game)	0	0	0	1	1
Not reported	1	0	0	0	1
Total	15	10	25	1	51*

*One study (Graser et al., 2021) evaluated three interventions, two of which were remote talking therapy delivered by psychotherapists and one was remote recovery support delivered via text messages, so this study is counted twice in the table. Another study (Kiluk et al., 2016) evaluated two interventions, both self-guided therapy, one delivered via fully automated and one delivered via partially automated means with technical support. This explains the total values of 51 rather than 49. One study did not report the status of the intervention provider (Nahum-Shani et al., 2017).

Modes of remote interaction

All the remote therapies reported were interactive, but delivered via different modes, see table 7 for details.

Table 7: Types of remote therapies by modes of interaction

Type of remote therapies / mode of interaction	Remote recovery support	Remote talking therapy	Self-guided therapy	Other	Total
Online computer	0	1	20	0	21
Text message	5	0	0	0	5
Interactive voice response (IVR)	0	0	3	0	3
Video games	0	0	0	1	1
Mobile phone apps	2	0	1	0	3
Video-conferencing	0	2	0	0	2
Telephone calls (voice)	5	6	0	0	11
Multi-modal	3	1	0	0	4
Total	15	10	24	1	50*

*One study (Graser et al., 2021) evaluated three interventions, two of which were remote talking therapy, and one was remote recovery support. This study is therefore represented in the counts for both remote talking therapy and remote recovery support for multi-modal interaction mode, adding the total values to 50 rather than 49.

Outcomes measured

The included studies reported many different intervention outcomes. The two most reported outcomes were days of drug and alcohol use within a specified period (n=29) and relapse (abstinence not maintained over a defined period) (n=21). These were measured by self-report and/or toxicology. Less commonly reported outcomes included longest period of continuous abstinence and days of risky drinking.

Comparators

A range of different comparators were used. In some studies (n=18) remote therapy was evaluated as a replacement (n=13) or partial replacement (n=5) for in-person treatment and/or recovery support components. These studies sought to examine whether the outcomes of participants receiving the remote therapy intervention were

comparable to, or at least not inferior to, those receiving in-person treatment and/or recovery support in the control arm.

In the remaining studies (n=31) remote therapies were evaluated as a supplement to in-person care with three distinct groups of comparators: remote therapy as a supplement to in-person care was compared to in-person care alone (n=24); in-person care plus remote therapy was compared to in-person care plus a placebo, sham or time equivalent control intervention (n=5); or in-person care followed by remote transitioning care was compared to in-person care with no transitioning care (n=2). These studies sought to examine whether the outcomes of those receiving the remote therapy intervention were superior to those in the control arm.

Eight studies were multi-arm trials evaluating more than one remote intervention (2 remote interventions, n=5 studies), (3 remote interventions, n=2 studies), (4 remote interventions, n=1 study).

Studies excluded prior to synthesis

We did not synthesise findings from seven of the 49 studies; four did not provide usable data on either of the two outcomes selected for synthesis (relapse and days of use) and three were non-randomised trials. It was determined that we had sufficient evidence from RCTs not to warrant inclusion of nRCTs in the synthesis.

3.1.4   Risk of bias of included studies

We appraised the quality of the 42 studies included in the syntheses for Analysis 1.

Eight of the 42 studies reported both outcomes selected for synthesis (days of use and relapse); so separate quality assessments were conducted for each outcome in these studies. This resulted in a total of 50 outcomes being assessed for risk of bias (see table 8 and appendix 3 for details).

Overall RoB: The risk of bias (RoB) was judged to be high for 35 outcomes and judged as some concerns for 13 (see table 3.1.5 and appendix 3). Two outcomes from the same study (Campbell et al., 2014) were assessed as being low risk.

Among 'days of use' outcomes (n=29), 22 were judged to have a high risk of bias; six to have some concerns, and one to have a low risk. Among 'relapse' outcomes (n=21), 13 were judged to be at high risk of bias, seven to have some concerns and one to have a low risk.

Table 8: Overall risk of bias, according to the outcomes reported and assessed

Outcomes assessed	Overall risk of bias (n=50 outcomes from 42 studies)			
	Low	*Some concerns*	*High*	*Total no. outcomes*
Days of drug use	1	6	22	29
Odds of relapse	1	7	13	21
Total no. outcomes	2	13	35	50*

*8 studies reported both outcomes, so total values are for 50 outcomes rather than 42 studies

The quality appraisal criteria comprise five domains each with sub-domains, details of which are available in Appendix 3. Across the 50 assessments, high risk of bias was particularly common for both Domain 3 (risk of bias due to missing outcome data) and Domain 4 (risk of bias due to the measurement of the outcome). As figures 4 and 5 demonstrate, a key difference in the risk of bias across the two outcome measures was in relation to Domain 4 – risk of bias in measurement of the outcome. In this domain 52% of studies measuring relapse were at low risk of bias whereas only 21% of studies measuring days of use were at low risk of bias. This likely reflects the fact that relapse is more easily measured by urine toxicology – whereas days of use was more likely to be measured by self-report which is inherently a less reliable measure.

Figure 4: Risk of bias per domain for studies with days of use outcomes (n=29)

Domain 1: 31% (green) | 69% (yellow)

Domain 2: 48% (green) | 38% (yellow) | 14% (red)

Domain 3: 38% (green) | 62% (red)

Domain 4: 21% (green) | 14% (yellow) | 66% (red)

Domain 5: 7% (green) | 86% (yellow) | 7% (red)

Overall: 3% (green) | 21% (yellow) | 76% (red)

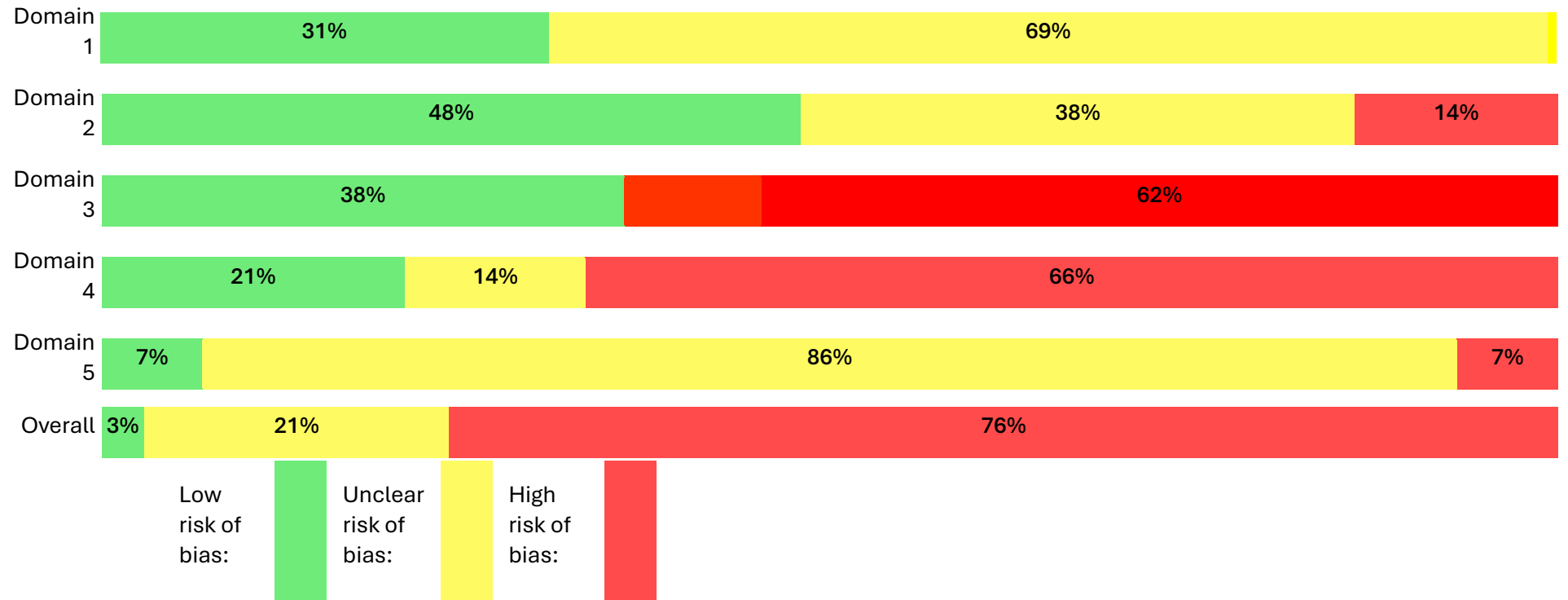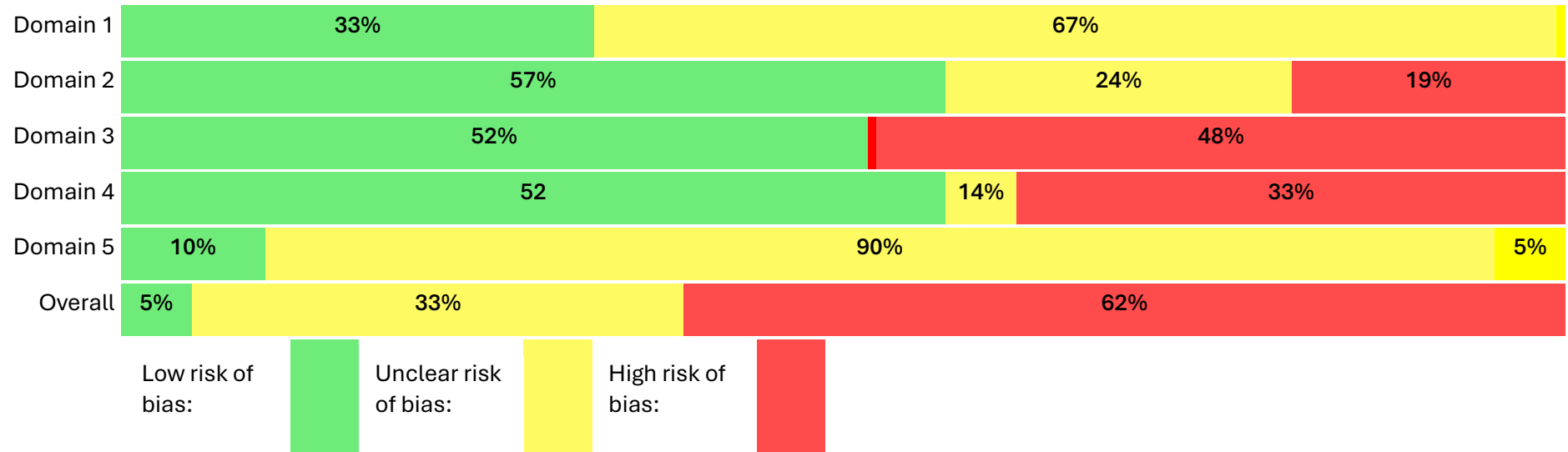Low risk of bias: (green)   Unclear risk of bias: (yellow)   High risk of bias: (red)

Figure 5: Risk of bias per domain for studies with relapse outcomes (n=21)

Domain 1: Risk of bias arising from the randomisation process.

- Low risk of bias (n=16 outcomes)
- Some concerns (n=34 outcomes)

All studies were of randomised design (the three non-randomised studies identified for this review were not synthesised). Concerns in risk of bias were mainly due to limited information provided about the methods and process of randomisation and allocation concealment, highlighting the potential for selection bias.

Domain 2: Risk of bias due to deviations from the intended interventions.

- Low risk of bias (n=26 outcomes)
- Some concerns (n=16 outcomes)
- High risk of bias (n=8 outcomes)

Blinding was not clearly reported in some studies. Most participants were likely to be aware of their assigned interventions and providers of the participants' assigned interventions during the trial. This may have influenced the participants' and the providers' behaviour with the potential for performance bias and detection bias in terms of recall in self-report as well as the implementation of the interventions by the people delivering the interventions.

Domain 3: Risk of bias due to missing outcome data.

- Low risk of bias (n=22 outcomes)
- High risk of bias (n=28 outcomes)

In most of the studies data was not available for all participants at each assessment point, with follow-up rate less than 95% (as per RoB 2 guidance). This missingness of data (attrition bias) is likely to influence the true values of the outcomes, for example, assuming missing data as indicating drug and alcohol use rather than abstinence, or vice versa. Few studies reported how missing data was dealt with, or explained the reasons for non-completion, or examined how the completers differed from the non-completers.

Domain 4: Risk of bias in measurement of the outcome.

- Low risk of bias (n=17 outcomes)
- Some concerns (n=7 outcomes)
- High risk of bias (n=26 outcomes)

Many studies were judged to have a high risk of bias in this domain. Nearly all studies measured outcomes with validated instruments. Most studies obtained self-reports of alcohol use using the Timeline Followback (TLFB) method. Although validated, these self-reports were nevertheless likely to have an inherent recall bias. This bias could

also be compounded by the awareness and knowledge of the interventions which the participants knew they were receiving. However, interventions which involved regular monitoring/reminder or journal keeping were also likely to have an easier or more accurate recall than the control group which often had less active/intensive management. Studies which assessed outcomes measured by toxicology/blood tests were judged to have a low risk of bias.

Domain 5: Risk of bias in selection of the reported results.

- Low risk of bias (n=4 outcomes)
- Some concerns (n=44 outcomes)
- High risk of bias (n=2 outcomes)

Most of the studies did not provide a trial protocol and information in the studies was insufficient to ascertain the authors' pre-specified intentions in which outcome measurements and analyses, such as intention-to-treat, to use with the likely potential for reporting bias.

Conclusion

We identified a range of studies that evaluated three main types of remote therapy (remote talking therapy, remote recovery support, self-guided therapy) that were delivered either parallel to a new or ongoing treatment phase, or when transitioning to a less intensive phase of treatment or recovery support. Most outcomes were assessed as being at high risk of bias, with only two outcomes from one study assessed as being of low risk of bias.

3.2 Analysis 1: Intervention effectiveness

3.2.1 Summary of intervention effectiveness analysis

- **Analysis 1 addressed the question:** How effective are interactive remote therapies for reducing drug/alcohol use?
- We were able to meta-analyse data on the effectiveness of remote therapies from 29 studies (n=34 interventions) and narratively synthesised effectiveness data for a further 13 studies.
- Most outcomes (n=35) were assessed to be at high risk of bias; 13 were assessed as having some concerns and two were assessed as having low risk of bias.
- Evidence demonstrates that *supplementing in-person treatment and/or recovery support with remote therapies is an effective approach to reducing the odds of relapse and days of drug and alcohol use:* among people who received remote therapy as a supplement to in-person treatment and/or recovery support, the odds of relapse were 30% lower [n=10 studies, n=15 interventions, n=1899 participants, OR 0.70 CI 0.57-0.86] and they had 19% fewer days of drug and alcohol use [n=14 studies, n= 2083 participants, SMD 0.81 CI 0.72-0.91] compared to those who received in-person care alone. Variation in the outcomes of individual studies indicates that identification of critical intervention and contextual features is warranted.
- Evidence indicates that *replacing or partially replacing in-person treatment and/or recovery support components with remote therapies does not lead to worse outcomes, but these findings are not conclusive.* Among people for whom in-person treatment and/or recovery support components were replaced or partially replaced by remote therapy, the odds of relapse were 55% lower [n=4 studies, n = 375 participants, OR 0.45 CI 0.24-0.84] and they had 8% fewer days of drug and alcohol use [n=8 studies, n = 1828 participants, SMD 0.92 CI 0.79-1.08] compared to those who received in-person care. Because the finding on relapse is based on limited evidence and the finding on days of use is not statistically significant, these findings do not provide conclusive evidence that remote therapy is superior to in-person treatment and/or recovery support, equally they do not provide conclusive evidence that remote therapy is inferior.
- These findings should be interpreted with caution, given the high risk of bias in the included studies (as well as concerns about their applicability to the English context – see section 4.2 for details)

As reported in section 2.8.3, we undertook four effectiveness syntheses, with 42 studies included. Within these, 29 studies were meta-analysed and 13 contributed to narrative syntheses. Table 9 below illustrates the number of interventions contributing to each meta-analysis and the number of studies contributing to the synthesis but not meta-analysed. The total number of interventions (n=40) across the meta-analyses is

greater than the total number of studies included in the meta-analyses (n=29). This is partly because a small number of studies (n=5) evaluated more than one remote therapy in a multi-arm study and so contributed to several times to a single synthesis (Graser et al., 2021; McKay et al., 2010, 2013; Mundt et al., 2006) or to multiple syntheses (Kiluk et al., 2016); and partly because a small number of studies (n=6) measured both relapse and days of use outcomes and so contributed to multiple syntheses (Campbell et al., 2014; Carroll et al., 2014; Farabee et al., 2013; Kiluk et al., 2018; Lucht et al., 2021; McKay et al., 2004). Each of the syntheses is presented and described below (sections 3.3.1 to 3.3.4).

Table 9: Details of the four effective syntheses

Analysis type	Assumption	Intervention	Comparator	Outcome	Synthesis	# remote therapies (studies) in meta-analysis*	# studies in narrative synthesis
Akin to Superiority	*Supplementing* standard in-person treatment and/or recovery support with *remote therapy will* *enhance its effectiveness*	In-person treatment and/or recovery support + remote therapy	In-person treatment and/or recovery support	Relapse	1	15 (10)	4
				Days of use	2	14	3
Akin to non-inferiority	When provided as an *alternative or partial alternative* to standard in-person treatment and/or recovery support components, remote therapy *will be no less effective*	Remote therapy	In-person treatment and/or recovery support	Relapse	3	4	3
				Days of use	4	8	5

* Some studies evaluated multiple remote therapies

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3.2.2 Effectiveness synthesis #1

Are people who receive *remote therapy as a supplement to in-person treatment and/or recovery support less likely to relapse* than those who receive in-person care alone?

A total of 14 studies comparing in-person treatment and/or recovery support plus remote therapy with in-person care alone provided data on relapse outcomes (see table 10). Data from 10 studies involving a total of 1899 participants were able to be meta-analysed; the remaining four studies involving 335 participants were synthesised narratively. Of the 10 meta-analysed studies, three evaluated two remote therapy interventions (McKay et al., 2010, 2013; Mundt et al., 2006) and one evaluated three remote therapy interventions (Graser et al., 2021); meaning a total of 15 remote therapy interventions contributed to the meta-analysis. Most studies evaluated interventions targeting alcohol (n=7 studies), one study evaluated an intervention for a mixed population including people in treatment for alcohol and for drugs, and the remaining six studies (including all three narratively synthesised studies) evaluated interventions targeting drugs. As table 10 illustrates, the interventions varied in length from 1-24 months.

Effectiveness synthesis #1 – Risk of bias of included studies (n=14 studies)

As illustrated in table 10, none of the 14 studies in this synthesis were at low risk of bias and only a minority (n=6) were judged to have some concerns. Most studies (n=8) were judged to be at high risk of bias; of these, most were judged to be at high risk of bias due to concerns about missing outcome data (n=6) and/or concerns about measurement of the outcome (n=7). See Appendix 3 for details.

Meta-analysis findings for effectiveness synthesis #1 (n=10 studies, n=15 remote therapy interventions)

As the pooled effect estimate in figure 6 illustrates, people who received in-person treatment and/or recovery support plus remote therapy were less likely to relapse than those who received in-person care alone [OR 0.70 CI 0.57-0.86]. The odds of relapse were 30% lower among people receiving remote therapy compared to controls and the confidence intervals do not cross the line of no effect. These findings therefore indicate that supplementing in-person treatment and/or recovery support with remote therapy represents an effective approach to reducing the odds of relapse, although since most studies were found to be at high risk of bias this finding should be interpreted with caution.

Figure 6: Effectiveness synthesis #1 – meta-analysis (n=15 remote therapy interventions)

Added RT: Odds of Relapse

Study Name/Arm	exp(b) (95% CI)	% Weight
DeMartini (2018) RS	0.11 (0.00, 2.72)	0.40
Mundt IVR (2006) SG	0.20 (0.03, 1.49)	1.04
Carroll (2014) SG	0.35 (0.14, 0.90)	4.83
Graser High Tel (2021) TT	0.43 (0.15, 1.21)	3.85
McKay TMC (2010) TT	0.48 (0.20, 1.17)	5.35
Gustafson (2014) RS	0.59 (0.35, 0.99)	15.39
Graser Low Tel (2021) TT	0.60 (0.22, 1.64)	4.09
Graser Tex (2021) RS	0.66 (0.24, 1.83)	4.04
McKay TMC (2013) TT	0.68 (0.30, 1.52)	6.45
Mundt IVR with F/U (2006) SG	0.73 (0.08, 6.41)	0.89
McKay TM (2010) RS	0.80 (0.34, 1.86)	5.88
McKay TMC+ (2013) TT	0.85 (0.37, 1.91)	6.31
Lucht (2020) RS	0.89 (0.61, 1.28)	30.92
Farabee (2013) TT	0.99 (0.48, 2.04)	8.07
Verduin (2013) Other	1.25 (0.34, 4.56)	2.50
Overall, DL (I^2 = 0.0%, p = 0.726)	0.70 (0.57, 0.86)	100.00

NOTE: Weights are from random-effects model

ES = Effect Size; RS = Remote recovery support intervention; SG = Self-guided therapy; TT = Remote talking therapy. Mundt et al. 2006 evaluated two interventions – interactive voice response (IVR) and IVR with follow up; Graser et al. 2021 evaluated three interventions – two telephone monitoring interventions at different intensities (High Tel and Low Tel) and a similar text-based intervention. The two studies by McKay each evaluated two variations of telephone monitoring (TM) or telephone monitoring and counselling (TMC).

Table 10: Studies included in effectiveness synthesis #1 (n=14 studies, n=18 remote therapy interventions)

Study (IV)	Synthesis	IV[1] type	IV timing	IV length (months)	Comparison	Substance focus	Risk of bias
Carroll (2014)	Meta-analysis	Self-guided therapy	Parallel	2	Remote + in-person vs in-person only	Drugs (Cocaine)	Some concerns
DeMartini (2018)	Meta-analysis	Remote recovery support	Parallel	2	Remote + in-person vs in-person only	Alcohol	Some concerns
Farabee all intervention arms (2013)	Meta-analysis	Remote talking therapy	Transitioning	3	Remote + in-person vs in-person only	Drugs (Stimulants)	High
Graser High Tel (2021)	Meta-analysis	Remote talking therapy	Transitioning	6	In-person treatment with remote transitioning vs in-person treatment with no transitioning	Alcohol	High
Graser Low Tel (2021)	Meta-analysis	Remote talking therapy	Transitioning	6	In-person treatment with remote transitioning vs in-person treatment with no transitioning	Alcohol	High
Graser Tex (2021)	Meta-analysis	Remote recovery support	Transitioning	6	In-person treatment with remote transitioning vs in-person treatment with no transitioning	Alcohol	High
Gustafson (2014)	Meta-analysis	Remote recovery support	Transitioning	8	Remote + in-person vs in-person only	Alcohol	High
Hubbard (2007)	Narrative synthesis	Remote talking therapy	Transitioning	1	Remote + in-person vs in-person only	Mixed (Any drug and/or alcohol)	High

Study (IV)	Synthesis	IV[1] type	IV timing	IV length (months)	Comparison	Substance focus	Risk of bias
Lucht (2020)	Meta-analysis	Remote recovery support	Transitioning	12	Remote + in-person vs in-person only	Alcohol	Some concerns
McKay TM (2010)	Meta-analysis	Remote recovery support	Transitioning	18	Remote + in-person vs in-person only	Alcohol	Some concerns
McKay TMC (2010)	Meta-analysis	Remote talking therapy	Transitioning	18	Remote + in-person vs in-person only	Alcohol	Some concerns
McKay TMC (2013)	Meta-analysis	Remote talking therapy	Transitioning	24	Remote + in-person vs in-person only	Drugs (Cocaine)	High
McKay TMC+ (2013)	Meta-analysis	Remote talking therapy	Transitioning	24	Remote + in-person vs in-person only	Drugs (Cocaine)	High
Moore (2013)	Narrative synthesis	Self-guided therapy	Parallel	1	Remote + in-person vs in-person only	Drugs (Opioids and cocaine)	Some concerns
Moore (2019)	Narrative synthesis	Self-guided therapy	Parallel	3	Remote + in-person vs in-person only	Drugs (illicit drugs)	Some concerns
Mundt IVR (2006)	Meta-analysis	Self-guided therapy	Transitioning	6	Remote + in-person vs in-person only	Alcohol	High
Mundt IVR with F/U (2006)	Meta-analysis	Self-guided therapy	Transitioning	6	Remote + in-person vs in-person only	Alcohol	High
Shi (2019)	Narrative synthesis	Self-guided therapy	Parallel	3	Remote + in-person vs in-person only	Drugs (Opioids)	High
Verduin (2013)	Meta-analysis	Other (game)	Parallel	3	Remote vs equal time sham / placebo	Alcohol	High

1 IV = intervention

Examining variation in findings from the meta-analysis #1

While the I^2 statistic indicates that the variability in outcomes is very unlikely to be due to statistical heterogeneity, it is evident that the point estimates of several studies show negligible impacts and in one study controls fared better than those receiving remote therapy (Verduin et al., 2013). As such consideration of the variation in interventions and comparators is warranted.

As figure 6 illustrates, the findings cover the full range of intervention types: remote recovery support (RS) (n=5), remote talking therapy (TT) (n=6), self-guided therapy (SG) (n=3) and one 'other' which was a computer simulation game evaluated by (Verduin et al., 2013). We employed sub-group analysis to examine whether variation in intervention type could explain the variation in outcomes (see figure 7).

Figure 7: Effectiveness synthesis #1 - sub-group analysis by intervention type
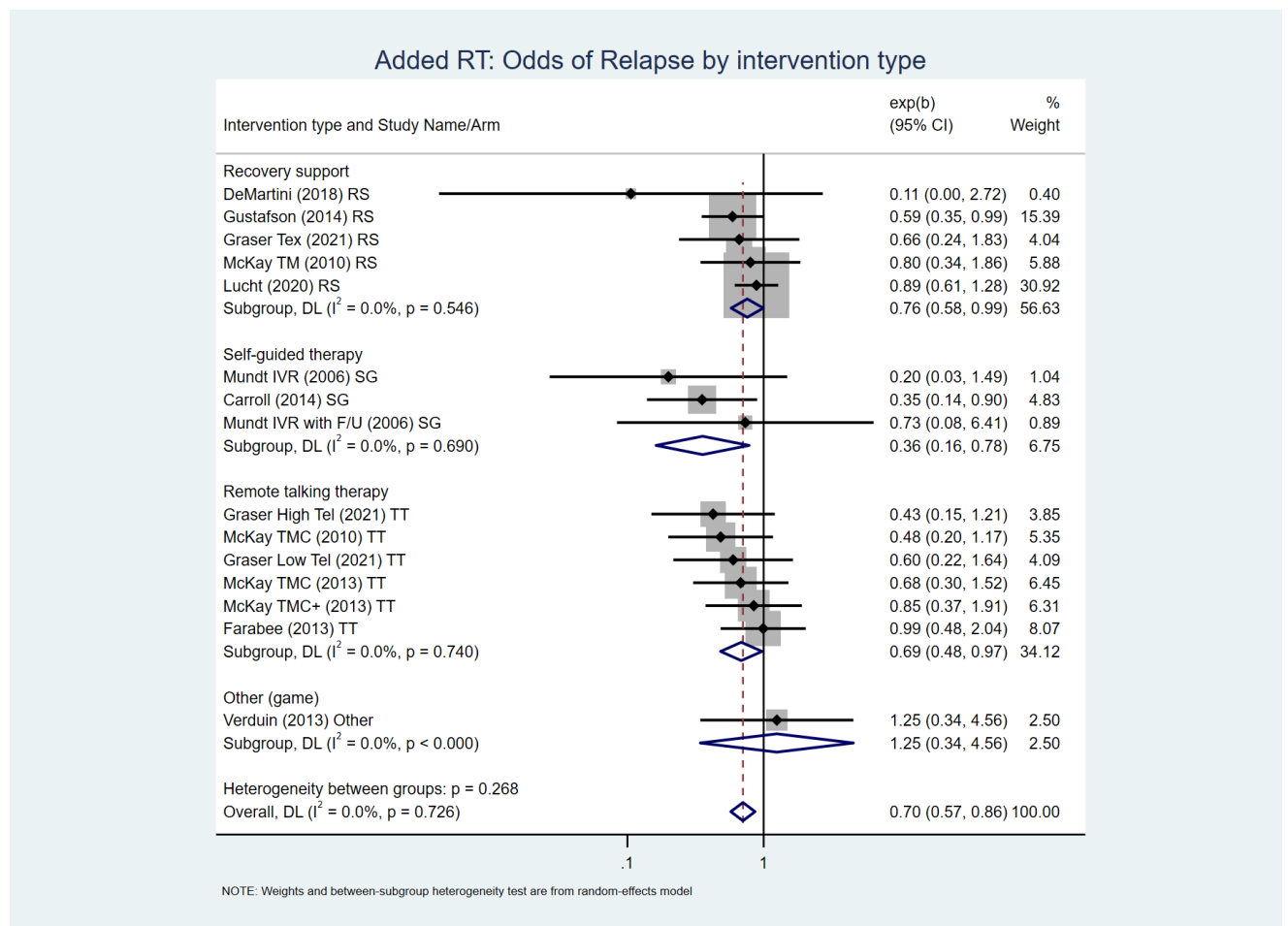
As figure 7 illustrates, the odds of relapse among those receiving the interventions compared to controls were reduced by 24% in recovery support interventions (n=5 interventions, OR 0.76 CI0.58-0.99) and 31% in remote talking therapy interventions (n=6 interventions, OR 0.69 CI 0.48-0.97). These findings suggest that remote talking therapies may generally be slightly more effective for reducing the likelihood of relapse than recovery support. Although much larger effect was seen for self-guided therapy interventions, odds of relapse were 64% lower than controls, the small number of interventions of this type mean this finding should be treated with caution (n= 3 interventions, OR 0.36 CI 0.16-0.78).

A second sub-group analysis, to identify whether outcomes differed depending on the substance focus of the interventions, found that interventions focused on alcohol use (n=11 interventions, OR 0.70, CI 0.55-0.89) achieved outcomes very similar to the pooled estimate for all 15 interventions (see figure 8). Interventions targeting mixed populations of people in treatment and/or recovery support for both alcohol and/or drugs (n=3 interventions, OR 0.61 CI 0.58 to 1.00) and drugs only (n=1 intervention, OR 0.99 CI 0.48-2.04) did not result in statistically significant effects; this is likely due to the smaller number of studies. The pooled estimates are therefore unable to indicate whether adding remote therapy to in-person care for reducing relapse is suited to a particular type of substance use.

Figure 8: Effectiveness synthesis #1 - sub-group analysis by substance focus of interventions
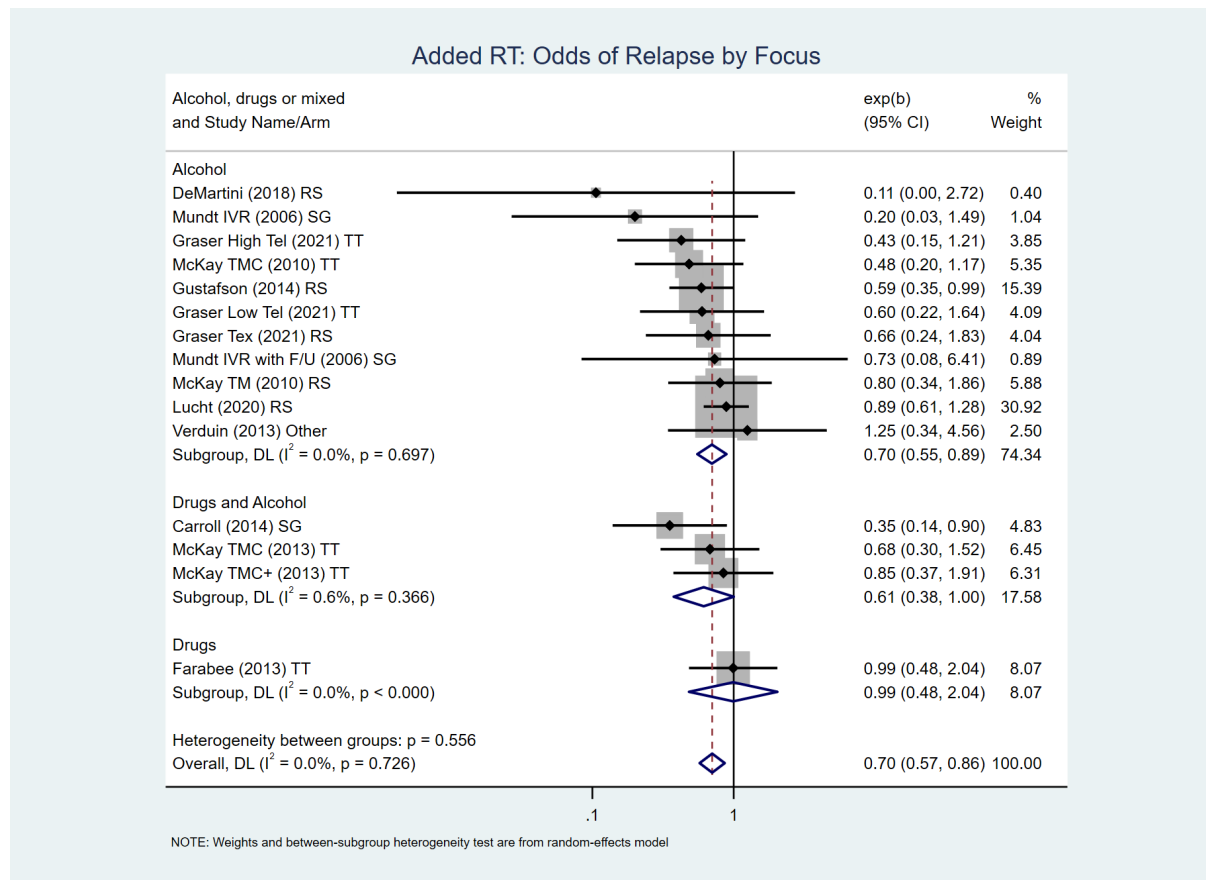
Most of the 15 remote therapy interventions (n=12 interventions, n=7 studies) were delivered when transitioning to a less intensive phase of treatment or recovery support (Farabee et al., 2013; Graser et al., 2021; Gustafson et al., 2014; Lucht et al., 2020; McKay et al., 2010, 2013; Mundt et al., 2006). Only three studies evaluated remote therapies delivered parallel to a new or continuing phase of standard outpatient care. A third sub-group analysis examined whether outcomes differed according to intervention timing. As the forest plot (figure 9) shows, the 'transitioning' sub-group achieves a pooled estimate of similar magnitude to the overall pooled estimate [OR 0.73 CI 0.59-0.90 vs OR 0.70 CI 0.57-0.86]. Because the 'parallel' sub-group pooled estimate [OR 0.51 CI 0.17-1.52] is based on few trials and displays high statistical heterogeneity (I^2 40.2%), it is not possible to identify whether intervention timing is a driver of differential effects.

Figure 9: Effectiveness synthesis #1 – sub-group analysis by intervention timing

Added RT: Odds of Relapse by Timing

Type of support and Study and Arm	exp(b) (95% CI)	% Weight
Parallel		
DeMartini (2018) RS	0.11 (0.00, 2.72)	0.40
Carroll (2014) SG	0.35 (0.14, 0.90)	4.83
Verduin (2013) Other	1.25 (0.34, 4.56)	2.50
Subgroup, DL (I^2 = 40.2%, p = 0.188)	0.51 (0.17, 1.52)	7.72
Transitioning		
Mundt IVR (2006) SG	0.20 (0.03, 1.49)	1.04
Graser High Tel (2021) TT	0.43 (0.15, 1.21)	3.85
McKay TMC (2010) TT	0.48 (0.20, 1.17)	5.35
Gustafson (2014) RS	0.59 (0.35, 0.99)	15.39
Graser Low Tel (2021) TT	0.60 (0.22, 1.64)	4.09
Graser Tex (2021) RS	0.66 (0.24, 1.83)	4.04
McKay TMC (2013) TT	0.68 (0.30, 1.52)	6.45
Mundt IVR with F/U (2006) SG	0.73 (0.08, 6.41)	0.89
McKay TM (2010) RS	0.80 (0.34, 1.86)	5.88
McKay TMC+ (2013) TT	0.85 (0.37, 1.91)	6.31
Lucht (2020) RS	0.89 (0.61, 1.28)	30.92
Farabee (2013) TT	0.99 (0.48, 2.04)	8.07
Subgroup, DL (I^2 = 0.0%, p = 0.857)	0.73 (0.59, 0.90)	92.28
Heterogeneity between groups: p = 0.532		
Overall, DL (I^2 = 0.0%, p = 0.726)	0.70 (0.57, 0.86)	100.00

NOTE: Weights and between-subgroup heterogeneity test are from random-effects model

Effectiveness synthesis #1 – studies not included in the meta-analysis (n=4 studies)

The four studies which were unable to be meta-analysed (see appendix 4 for reasons) showed similar findings to those in the meta-analysis; three showed non-significant positive impacts on the likelihood of relapse (Hubbard et al., 2007; Moore et al., 2013, 2019) and the fourth showed a significant positive effect (Shi et al., 2019).

3.2.3 Effectiveness synthesis #2

Do people who receive in-person treatment and/or recovery support <u>supplemented with remote therapies</u> have <u>fewer days of drug and alcohol use</u> than those who receive in-person care alone?

A total of 17 studies comparing in-person treatment and/or recovery support plus remote therapy with in-person care alone provided data on days of use outcomes. Data from 14 studies (n=14 interventions) involving a total of 2,083 participants were able to be meta-analysed; the remaining three studies involving 519 participants were synthesised narratively. Most studies evaluated interventions targeting mixed drug/alcohol use populations (n=8 studies), six studies focused on drug use, and the remaining three studies focused on alcohol use. Most studies focused on self-guided therapy (n=11), with five focused on remote recovery support and just one focused on remote talking therapy. See table 11 for details.

Effectiveness synthesis #2 – Risk of bias of included studies

As illustrated in table 11, none of the 17 studies were at low risk of bias. Six were judged to have some concerns but most studies (n=11) were judged to be at high risk of bias. See Appendix 3 for details.

Meta-analysis findings for effectiveness synthesis #2 (n=14 studies; n=14 remote therapy interventions)

The forest plot for this meta-analysis is presented in figure 10. The pooled estimate indicates people who received in-person treatment and/or recovery support plus remote therapy had fewer days of drug or alcohol use [n=14 studies, n= 2,083 participants, SMD -0.21 CI -0.33, -0.10] compared to those who received in-person care alone. These findings suggest that supplementing in-person treatment with remote therapy is an effective approach for reducing the number of days of drug/alcohol use.

Figure 10: Effectiveness synthesis #2 – meta-analysis (n=14 remote therapy interventions)
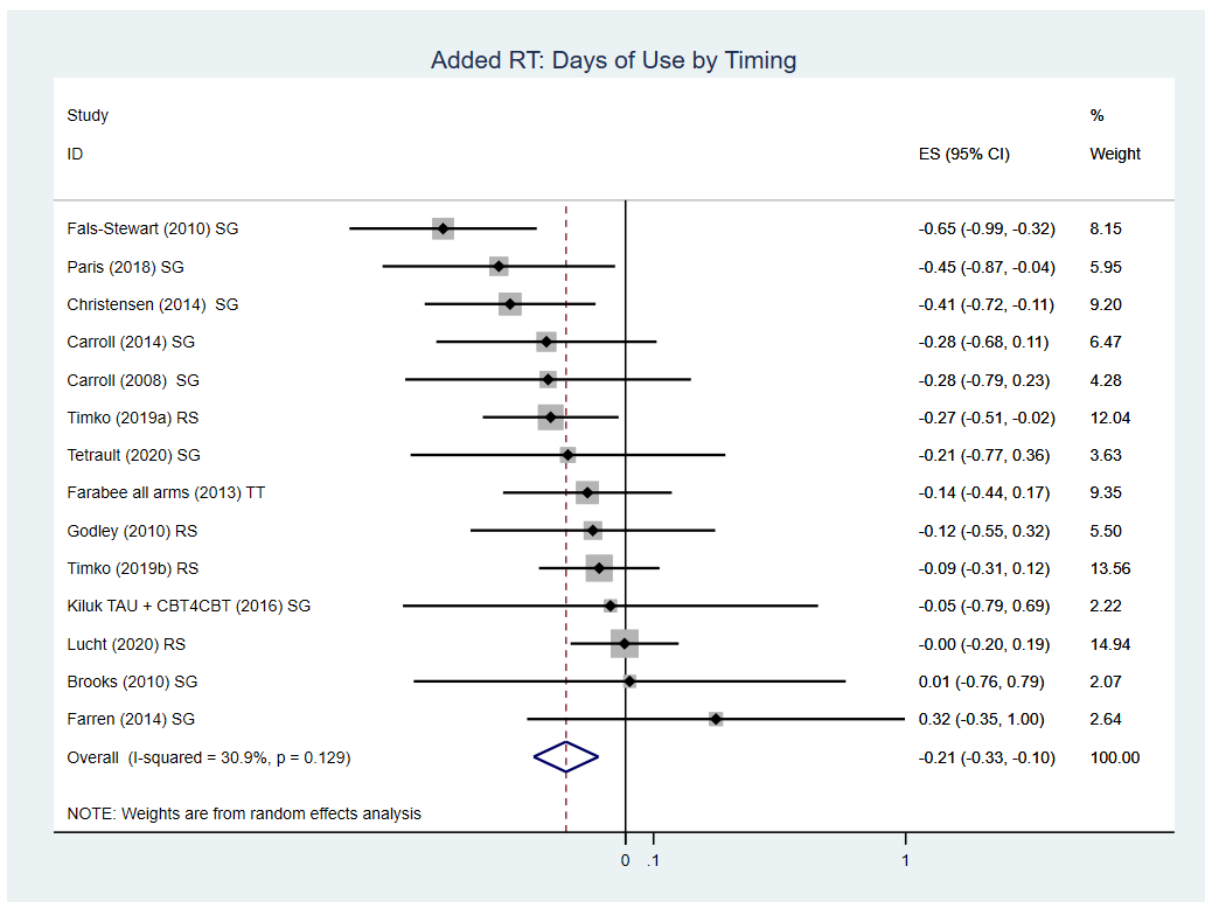
Table 11: Studies included in effectiveness synthesis #2 (n=17 studies)

Study	Synthesis	IV type	IV timing	IV length (months)	Comparator	Substance focus	Risk of bias
Brooks (2010)	Meta-analysis	Self-guided therapy	Parallel	2	Remote vs equal time sham / placebo	Drugs (cocaine)	High
Carroll (2008)	Meta-analysis	Self-guided therapy	Parallel	2	Remote + in-person vs in-person only	Mixed (Any drug and/or alcohol)	High
Carroll (2014)	Meta-analysis	Self-guided therapy	Parallel	2	Remote + in-person vs in-person only	Drugs (cocaine)	Some concerns
Carroll (2018)	Narrative synthesis	Self-guided therapy	Parallel	3	Remote + in-person vs in-person only	Drugs (cocaine)	Some concerns
Christensen (2014)	Meta-analysis	Self-guided therapy	Parallel	3	Remote + in-person vs in-person only	Drugs (opioids)	Some concerns
Fals-Stewart (2010)	Meta-analysis	Self-guided therapy	Parallel	2	Remote vs equal time sham / placebo	Mixed (Any drug and/or alcohol)	High
Farabee all intervention arms (2013)	Meta-analysis	Remote talking therapy	Transitioning	3	Remote + in-person vs in-person only	Drugs (stimulants)	High
Farren (2014)	Meta-analysis	Self-guided therapy	Parallel	1	Remote vs equal time sham / placebo	Alcohol	High
Godley (2010)	Meta-analysis	Remote recovery support	Transitioning	3	Remote + in-person vs in-person only	Mixed (Any drug and/or alcohol)	High
Kiluk TAU + CBT4CBT (2016)	Meta-analysis	Self-guided therapy	Parallel	2	Remote + in-person vs in-person only	Alcohol	Some concerns
Lucht (2020)	Meta-analysis	Remote recovery support	Transitioning	12	Remote + in-person vs in-person only	Alcohol	Some concerns
Moore (2019)	Narrative synthesis	Self-guided therapy	Parallel	3	Remote + in-person vs in-person only	Drugs (illicit drug use)	High
Paris (2018)	Meta-analysis	Self-guided therapy	Parallel	2	Remote + in-person vs in-person only	Mixed (Any drug and/or alcohol)	Some concerns
Scott (2020)	Narrative synthesis	Remote recovery support	Transitioning	6	Remote + in-person vs in-person only	Mixed (Any drug and/or alcohol)	High
Tetrault (2020)	Meta-analysis	Self-guided therapy	Parallel	2	Remote + in-person vs in-person only	Mixed (Any drug and/or alcohol)	High
Timko (2019a)	Meta-analysis	Remote recovery support	Transitioning	3	Remote + in-person vs in-person only	Opioids and/or alcohol	High
Timko (2019b)	Meta-analysis	Remote recovery support	Transitioning	3	In-person treatment with remote transitioning vs in-person treatment with no transitioning	Mixed (Any drug and/or alcohol)	High

Examining variation in findings from the meta-analysis #2

The I² statistic (30.9%) indicates between study heterogeneity. However, the point estimates of several studies show negligible impacts and in two studies controls fared better than those receiving remote therapy (Brooks et al., 2010; Farren et al., 2014). As such consideration of the variation in interventions and comparators is warranted.

Figure 11: Effectiveness synthesis #2 - sub-group analysis by intervention type
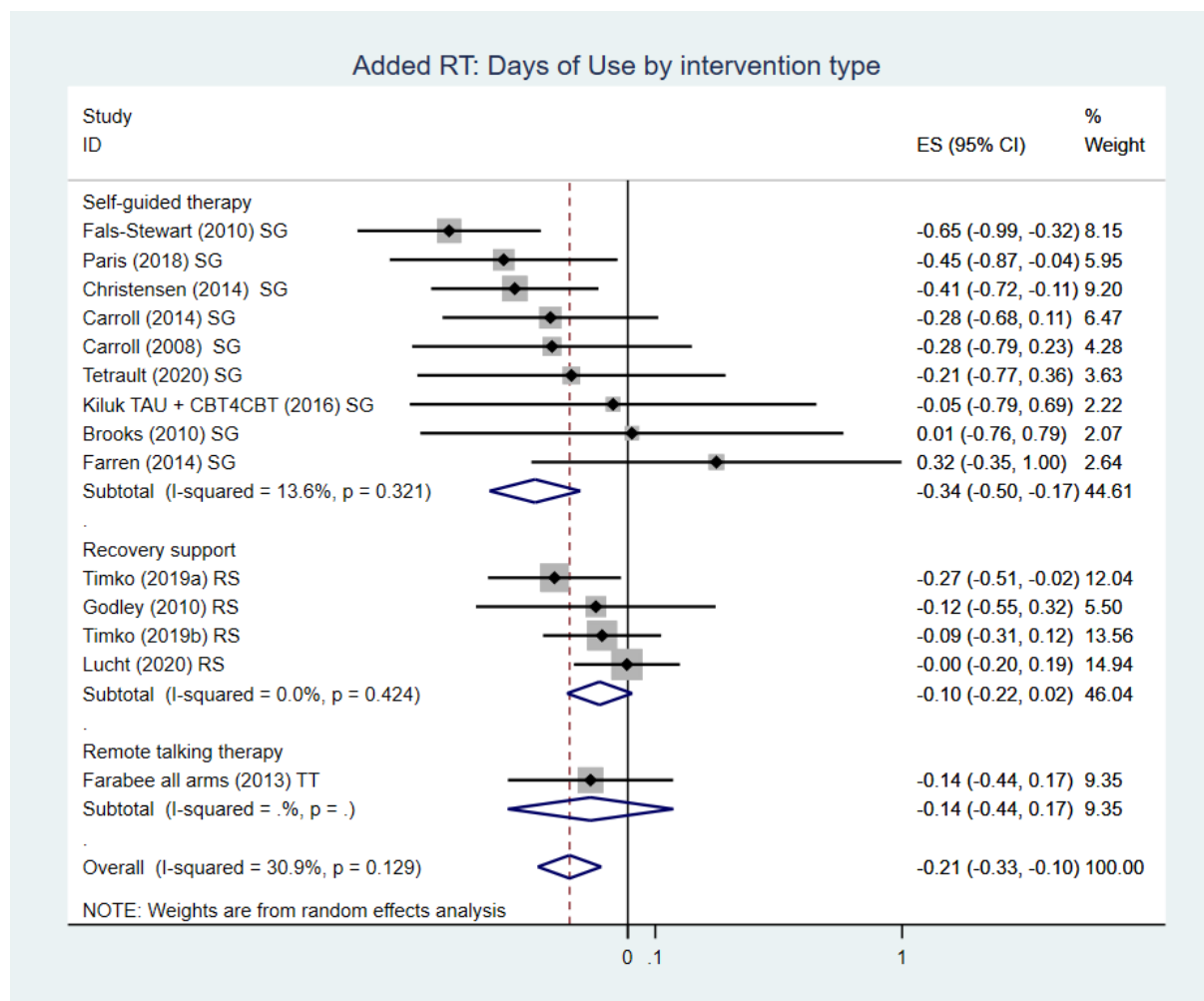
As figure 11 illustrates, the standardised mean difference of days of use between those receiving self-guided therapy (SG) compared to controls showed fewer days of use (n=9 interventions, SMD -0.34 CI -0.50, -0.17); this finding is statistically significant. The findings for remote talking therapy interventions (n=1 intervention, SMD -0.14 95% CI: -0.44, 0.17) and remote recovery support (n=4 interventions, SMD -0.10 CI -0.22, 0.02) showed smaller differences and the findings were not statistically significant. These findings for days of use contrast with those for relapse (see figure

11) which found significant positive effects of talking therapy on relapse, but not self-guided therapy. It is possible that different types of therapy are appropriate for achieving different outcomes. However, it is notable that significant positive impacts are identified in each synthesis for the intervention types with the greatest weight of available evidence.

A sub-group analysis examining impacts on days of use by substance focus found significant positive outcomes for remote therapies delivered to mixed drug/alcohol use populations [n= 8 interventions, SMD -0.28 CI -0.42, -0.14] and drug use populations [n=3 interventions, SMD -0.25, CI -0.46, -0.04] (see figure 12). Findings for interventions targeting alcohol use showed no significant difference between groups [n=3 interventions, SMD 0.02, CI -0.16, 0.20]. The findings may indicate that remote therapy is less suited for reducing days of use among people in alcohol treatment and/or recovery support but given the variation in populations and interventions offered this is by no means conclusive.

Figure 12: Effectiveness synthesis #2 - sub-group analysis by substance focus of interventions
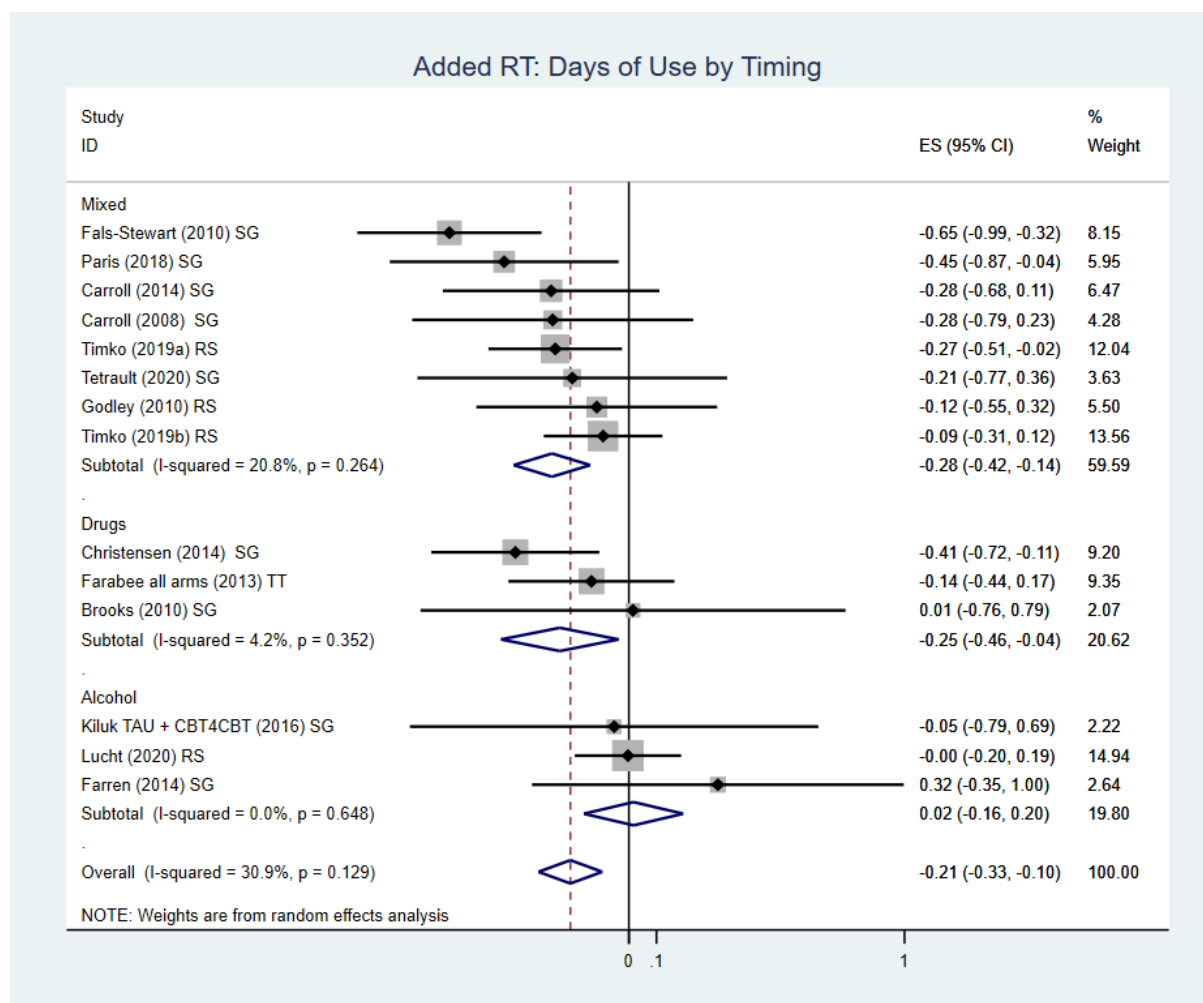
A sub-group analysis examining impacts on days of use by intervention timing (figure 13) showed that parallel interventions achieved a slightly greater reduction in days of use [SMD -0.34, CI -0.50, -0.17] compared to transitioning interventions [SMD 0.11 - 0.22, 0.00]. However, since these two pooled effect estimates overlap, the findings do not indicate clear difference in effect.

Figure 13: Effectiveness synthesis #2 - sub-group analysis by intervention timing
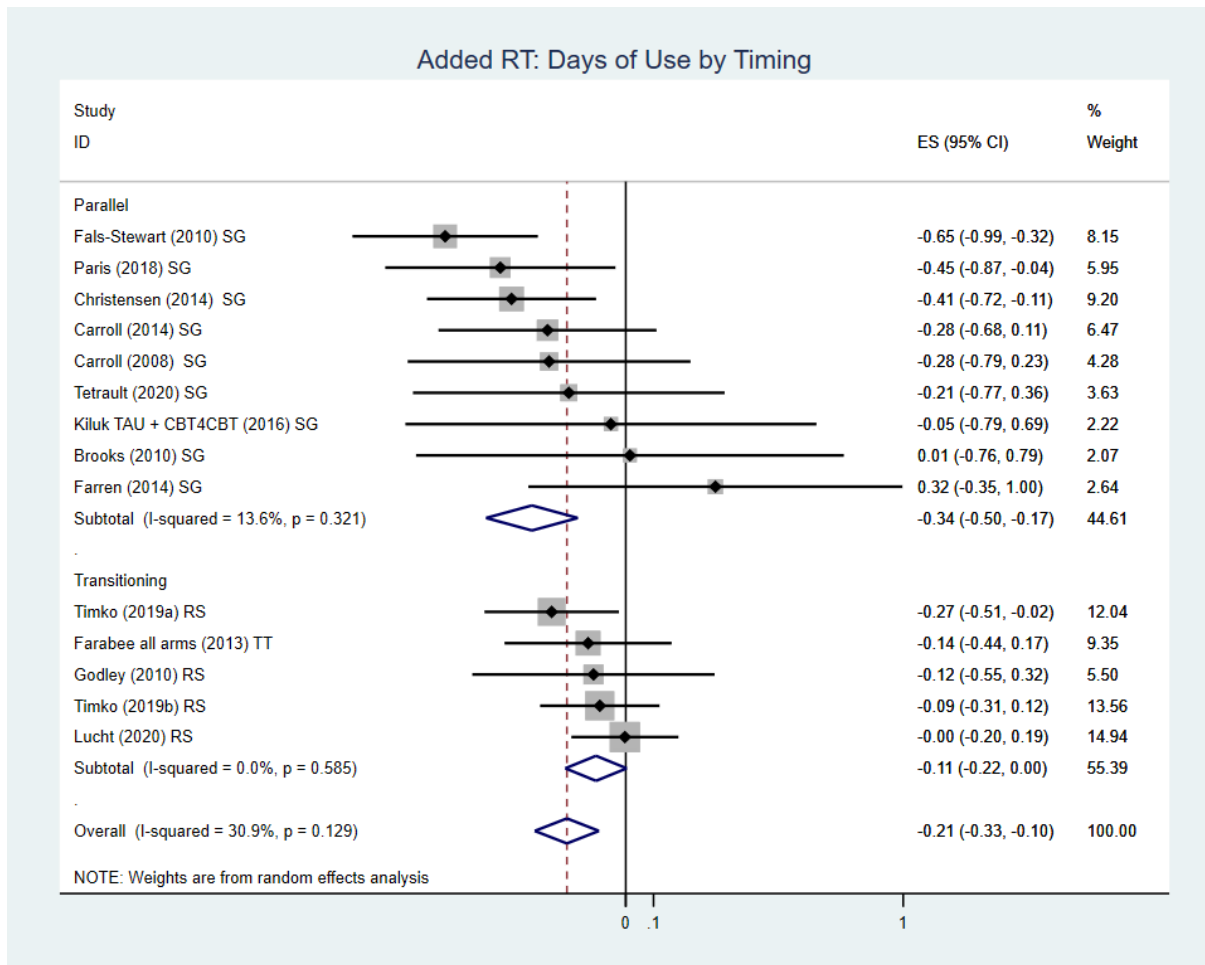
Effectiveness synthesis #2 – studies not included in the meta-analysis (n=3 studies)

Random effect regression analyses in two studies showed positive significant impacts on days of use (Carroll et al., 2018; Moore et al., 2019). A third study, a multi-arm trial, found significant effects from regression analysis for ecological momentary interventions (EMI) but findings were not significant for Ecological Momentary Assessment (EMA) or for a combination of EMA and EMI (Scott et al., 2020).

3.2.4 Effectiveness synthesis #3

Are people who receive <u>remote therapies as a replacement or partial replacement</u> for in-person treatment and/or recovery support components <u>no more likely to relapse</u> than those who receive in-person care?

A total of seven studies (n=7 interventions) comparing remote therapies as a replacement (n=5) or partial replacement (n=2) for in-person treatment and/or recovery support components provided data on risk of relapse outcomes. Data from four studies involving a total of 871 participants were able to be meta-analysed; the remaining three studies involving 197 participants were synthesised narratively.

The studies evaluated interventions targeting mixed drug/alcohol use populations (n=4 studies) or drug use only (n=3); none focused solely on alcohol. Three studies evaluated self-guided therapy; three evaluated remote talking therapy and one evaluated remote recovery support. Five interventions were delivered parallel to a new or ongoing treatment and/or recovery support phase and two were delivered when transitioning to a less intensive phase of care. See table 12 for details.

Effectiveness synthesis #3 – Risk of bias of included studies

As can be seen in table 12, only one study was judged to be at low risk of bias for this outcome and one was judged to have some concerns. The remaining five were judged to be at high risk of bias. See appendix 3 for details.

Meta-analysis findings for effectiveness synthesis #3 (n=4 studies)

The forest plot for this meta-analysis is presented in figure 14. The pooled effect estimate indicates people who received a remote therapy as a replacement or partial replacement for in-person treatment and/or recovery support components were less likely to relapse than those who received exclusively in-person care [OR 0.45 CI 0.24-0.84]. The odds of relapse were 55% lower among those receiving remote therapy compared to controls. However, since there were only four studies included in this synthesis, and one of these was a small study with a high risk of bias, which may have skewed the results, this finding should be interpreted with caution. Sub-group analyses were not undertaken for this synthesis due to the limited number of studies.

Figure 14: Effectiveness synthesis #3: meta-analysis (n=4 studies)

Replace RT: Odds of Relapse

Study ID	ES (95% CI)	% Weight
Gonzales (2014) RS	0.10 (0.03, 0.33)	16.31
Kiluk (2018a) SG	0.42 (0.16, 1.13)	19.67
Campbell (2014) SG	0.61 (0.42, 0.88)	34.30
McKay (2004) TT	0.76 (0.44, 1.33)	29.71
Overall (I-squared = 69.5%, p = 0.020)	0.45 (0.24, 0.84)	100.00

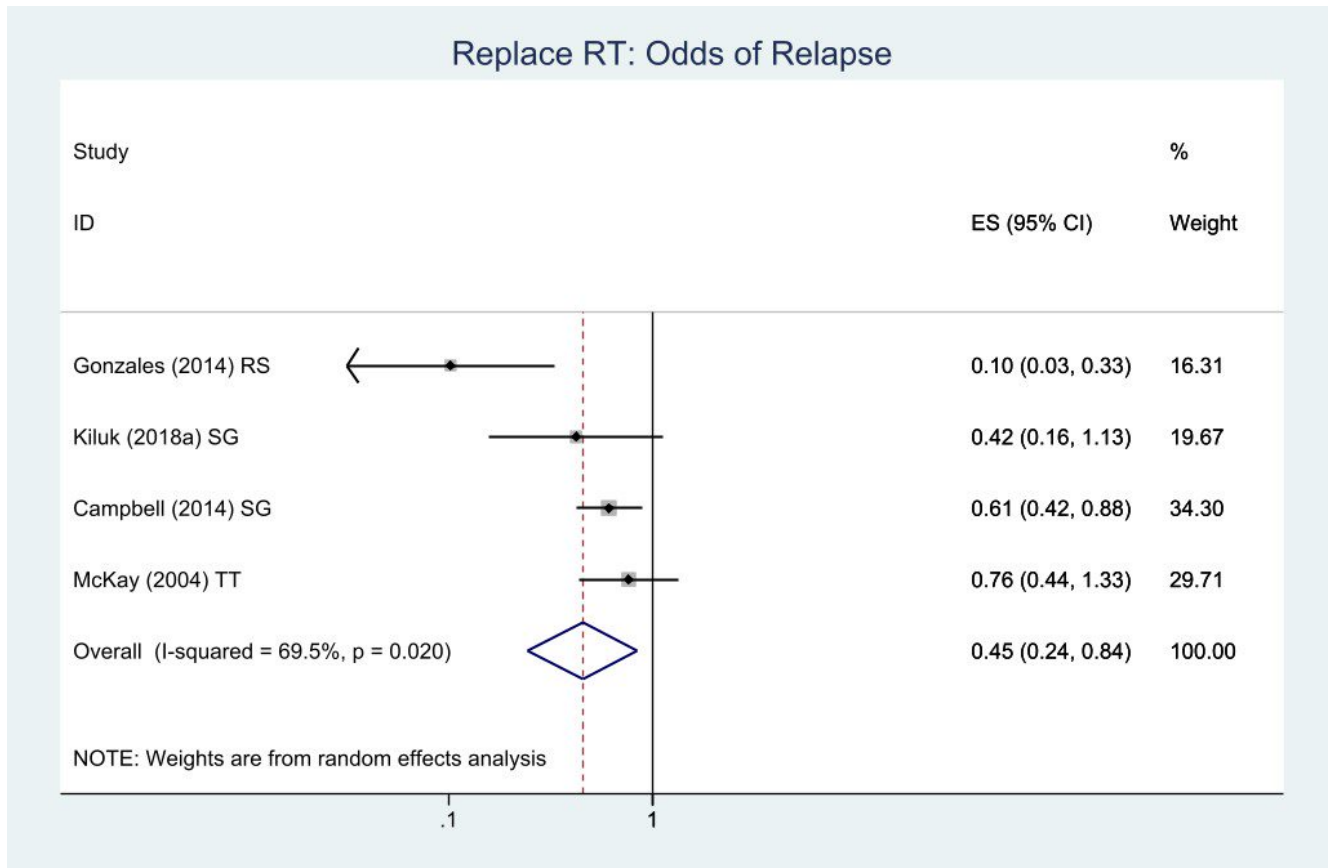NOTE: Weights are from random effects analysis

Table 12: Studies included in effectiveness synthesis #3 (n=7 studies)

Study (IV)	Synthesis	IV type	IV timing	IV length (months)	Comparator	Substance focus	Risk of bias
Budney (2015)	Narrative synthesis	Self-guided therapy	Parallel	3	Remote vs in-person	Drugs (Cannabis)	Some concerns
Campbell (2014)	Meta-analysis	Self-guided therapy	Parallel	3	Remote partially replaces in-person vs in-person	Mixed (Illicit drug use with or without alcohol)	Low
Gonzales (2014)	Meta-analysis	Remote recovery support	Transitioning	3	Remote vs in-person	Mixed (Any drug and/or alcohol)	High
Kiluk (2018a)	Meta-analysis	Self-guided therapy	Parallel	3	Remote vs in-person	Mixed (Cocaine, marijuana, opioid, or alcohol)	High
King (2009)	Narrative synthesis	Remote talking therapy	Parallel	1.5	Remote partially replaces in-person vs in-person	Drugs (opioids, cocaine, benzodiazepines, amphetamine, and cannabis)	High
King (2014)	Narrative synthesis	Remote talking therapy	Parallel	3	Remote vs in-person	Drugs (opioids, cocaine, benzodiazepines, amphetamine and cannabis)	High
McKay (2004)	Meta-analysis	Remote talking therapy	Transitioning	3	Remote vs in-person	Mixed (Cocaine and Alcohol)	High

Effectiveness synthesis #3 – studies not included in the meta-analysis (n=3)

All three studies showed non-significant differences in relapse between intervention and control groups (Budney et al., 2015; King et al., 2009, 2014).

3.2.5   Effectiveness synthesis #4

Do people who receive remote therapy <u>as a replacement or partial replacement</u> for in-person treatment and/or recovery support components have <u>no more days of drug and alcohol use</u> than those who receive exclusively in-person care?

A total of 13 studies comparing remote therapies as a replacement (n=10 studies) or partial replacement (n=3 studies) for in-person treatment and/or recovery support components provided data on days of use outcomes. Data from eight studies (n=8 interventions) involving a total of 1,610 participants were able to be meta-analysed; the remaining five studies involving 922 participants were synthesised narratively. Most of the interventions studied targeted mixed drug/alcohol use populations (n=7 studies), three studies evaluated interventions for alcohol use and three evaluated an intervention targeting drug use. Eight interventions were self-guided therapy and five were remote talking therapy; none were remote recovery support. Nine interventions were delivered parallel to a new or ongoing phase of treatment and/or recovery support and four were delivered when transitioning to a less intensive phase of care.

Effectiveness synthesis #4 – Risk of bias of included studies

Only one the 13 studies in this synthesis was at low risk of bias and another was judged to have some concerns. The remaining 11 studies were at high risk of bias (table 13 and Appendix 3 for details).

Meta-analysis findings for effectiveness synthesis #4 (n=8 studies)

The eight studies with data amenable to meta-analysis were mostly self-guided therapy interventions (n=6) delivered parallel to a new or ongoing treatment and/or recovery support phase (n=7). The pooled effect estimate indicates that people who received remote therapy as a replacement or partial replacement for in-person treatment and/or recovery support components had fewer days of use compared to those who received exclusively in-person care, but the finding is **not significant** [SMD -0.08 CI -0.24, 0.07]. The I^2 measure suggests a moderate level of statistical heterogeneity. We did not conduct sub-group analyses for this synthesis because of the small number of studies, but as figure 15 illustrates, there is variation in outcomes, from positive through to negative effects across the studies indicating that consistent effects are unlikely. As such, whilst the non-significant finding does not conclusively indicate that remote therapy is superior to in-person treatment and/or recovery support, given the non-inferiority nature of this synthesis, this finding may be cautiously interpreted as evidence that remote therapy is not conclusively worse than in-person treatment and/or recovery support.

Figure 15: Effectiveness synthesis #4 – meta-analysis #4 (n=8 remote therapy interventions)
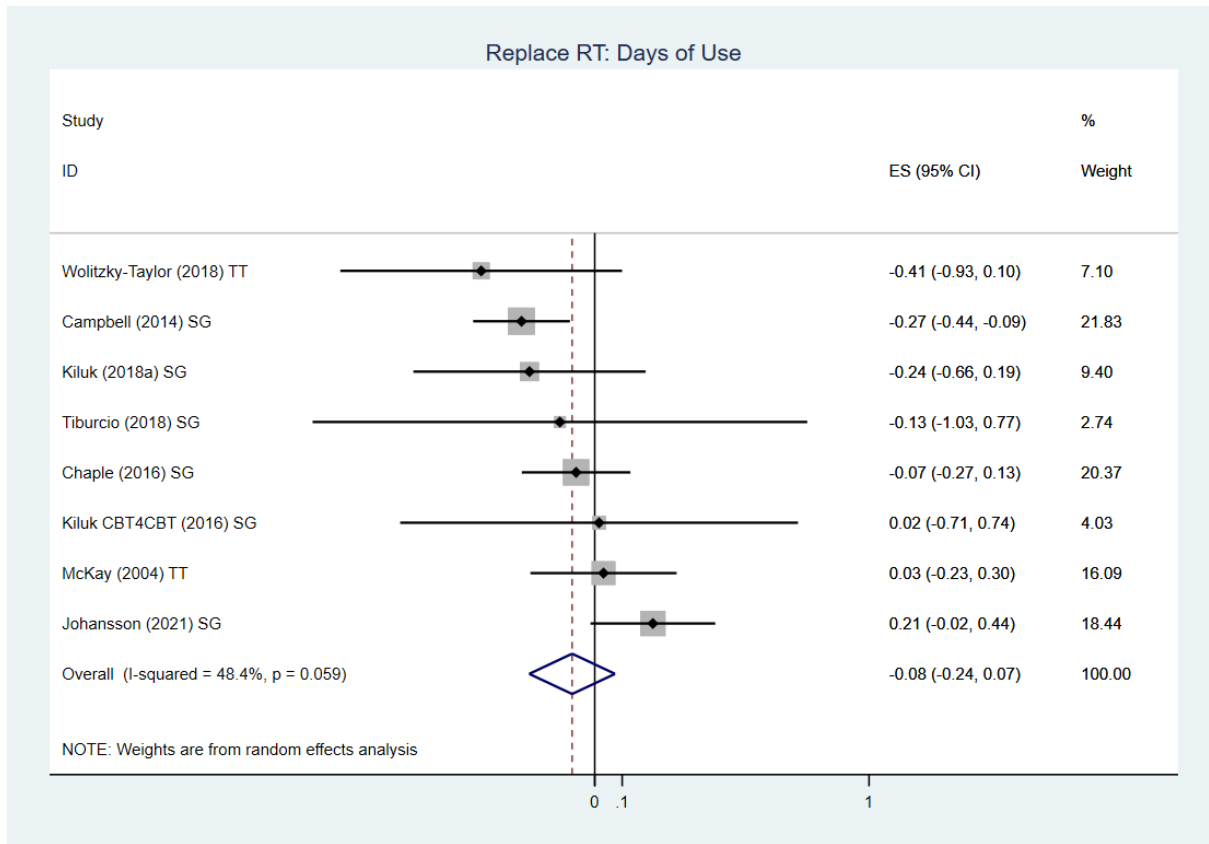
Table 13: Studies included in effectiveness synthesis #4 (n=13 studies)

Study (IV)	Synthesis	IV type	IV timing	IV length (months)	Comparison	Substance focus	Risk of bias
Budney (2015)	Narrative synthesis	Self-guided therapy	Parallel	3	Remote vs in-person	Drugs (Cannabis)	High
Campbell (2014)	Meta-analysis	Self-guided therapy	Parallel	3	Remote partially replaces in-person vs in-person	Mixed (Illicit drug use with or without alcohol)	Low
Chaple (2016)	Meta-analysis	Self-guided therapy	Parallel	6	Remote vs in-person	Mixed (Any drug and/or alcohol)	High
Johansson (2021)	Meta-analysis	Self-guided therapy	Parallel	3	Remote vs in-person	Alcohol	High
Kiluk (2018a)	Meta-analysis	Self-guided therapy	Parallel	3	Remote vs in-person	Mixed (Cocaine, marijuana, opioid, or alcohol)	High
Kiluk CBT4CBT (2016)	Meta-analysis	Self-guided therapy	Parallel	2	Remote vs in-person	Alcohol	Some concerns
Marsch (2014)	Narrative synthesis	Self-guided therapy	Parallel	12	Remote partially replaces in-person vs in-person	Drugs (Opioids)	High
McKay (2004)	Meta-analysis	Remote talking therapy	Transitioning	3	Remote vs in-person	Mixed (Cocaine and Alcohol)	High
McKellar (2012)	Narrative synthesis	Remote talking therapy	Transitioning	6	Remote vs in-person	Mixed (Any drug and/or alcohol)	High
Nichols (2015)	Narrative synthesis	Remote recovery support	Transitioning	4	Remote partially replaces in-person vs in-person	Alcohol	High
Tiburcio (2018)	Meta-analysis	Self-guided therapy	Parallel	2	Remote vs in-person	Drugs (Marijuana, inhalants, cocaine)	High
Wenze (2015)	Narrative synthesis	Remote recovery support	Transitioning	6	Remote vs in-person	Mixed (Any drug and/or alcohol)	High
Wolitzky-Taylor (2018)	Meta-analysis	Remote talking therapy	Parallel	2 (7 weeks)	Remote partially replaces in-person vs in-person	Mixed (Any drug and/or alcohol)	High

Effectiveness synthesis #4 – studies not included in the meta-analysis (n=5)

Four studies showed no significant differences in the days of use between those receiving remote or partially remote therapies compared to those receiving in-person treatment and/or recovery support (Budney et al., 2015; McKellar et al., 2012; Nichols, 2015; Wenze et al., 2015). One study, which measured weeks of use rather than days, found significantly lower percentage of overall weeks of use in the intervention group compared to controls (Marsch et al., 2014).

3.2.6 Conclusion

Remote therapies can be an effective approach to reducing the likelihood of relapse and days of drug and alcohol use, when supplementing in-person treatment and/or recovery support. Evidence on replacing or partially replacing in-person treatment and/or recovery support components with remote therapies is not conclusive, but it does not appear to lead to worse outcomes. There are limitations to the evidence in terms of robustness and relevance; most trials were found to be at high risk of bias, none were from the UK and many interventions and populations varied from those typically seen in the English context (discussed in more detail in section 4.2). Update searches in 2023 identified further studies but the overall findings were little changed; see Appendix 5 for details. To explore the variation in the nature and outcomes of individual interventions further, the subsequent section reports findings from our analysis seeking to identify which intervention and contextual features appear to be critical for achieving effective outcomes.

3.3   Analysis 2: Intervention features

3.3.1 Summary of intervention features analysis

- **Analysis 2 addressed the question:** Which intervention and implementation features of remote therapies are associated with greater reductions in drug/alcohol use?
- The analysis is based on 13 studies which met the criteria to be included in either the most effective outcome set (n=8) or the least effective outcome set (n=5).
- We conducted three QCAs to examine conditions relating to key principles underpinning the remote therapy approaches:
- **Principle 1 – meeting treatment and recovery needs:** This QCA comprised of three conditions: a) offering an appropriate level of service; b) motivating abstinence; and c) being delivered to those with higher severity drug/alcohol use disorder (DAUD). All the most effective remote therapies (n=8) offered an appropriate level of service in addition to motivating abstinence and/or being delivered to those with higher severity DAUD. All least effective interventions (n=5) did not motivate abstinence and lacked at least one other condition.
- **Principle 2 – taking a person-centred approach:** This QCA comprised of two conditions: a) targeting to address the needs of specific cultural group; and b) tailoring to meet individual needs and preferences. Most of the effective remote therapies (n=6) met at least one of these two conditions. All the least effective remote therapies (n=5) lacked both conditions; however, two of the most effective interventions lacked both conditions also.
- **Principle 3 – maximising service use:** This QCA comprised of two conditions: a) remote therapy supports engagement with in-person treatment; and b) remote therapy encourages use of other available services. Most of the most effective remote therapies (n=6) met at least one of these two conditions. All the least effective remote therapies (n=5) lacked both conditions; however, two of the most effective interventions lacked both conditions also.
- Overall, the findings suggest that all three principles are important. Meeting treatment and recovery needs appears to be a necessary but not sufficient principle underpinning the most effective remote therapies; the most effective remote therapies also either took a person-centred approach and/or supported use of other services.

Whilst the meta-analysis findings are positive overall, individual studies contributing to the meta-analyses included some with potentially harmful effects – i.e. the findings suggested that relapse or number of days of drug/alcohol use were increased among the remote therapy recipients relative to controls. Analysis 2 uses this variation in outcomes to systematically explore intervention and implementation features

associated with the most and least effective remote therapies. See section 2.8 for a brief account and section 5.10 for a detailed account of the methods for Analysis 2.

3.3.2 Cases and outcome sets: Most and least effective remote therapies (n=13)

Studies included in the meta-analysis were assessed for inclusion in the QCA based on their outcomes. Eight studies met the criteria for inclusion in the most effective set and five for inclusion in the least effective set (see section 2.8 for criteria). As illustrated in table 14 below, none of the cases in the QCA involved remote talking therapy. In the least effective set (n=5) one case was remote recovery support, another was the game evaluated by (Verduin et al., 2013) and the remaining three were self-guided therapy interventions.

In the most effective set (n=8) five were self-guided therapy and three were remote recovery support. Three of the 13 studies in the QCA measured two outcomes. Campbell et al. (2014) was in the most effective for both days of use and relapse; Carroll et al. (2014) was most effective for relapse, but findings were not significant for days of use; Lucht et al. (2020) was least effective for both outcomes.

Table 14: Details of outcome sets: Most and least effective remote therapies (n=13)

	Case (study)	Risk of bias	Intervention type / timing	Sub-stance	Comparison type	Out-come	Effect size (CI 95%)
Least effective remote therapies (n=5)							
1	Lucht (2020)	Some concerns	Remote recovery support (transitioning)	Alcohol	RT supplements in-person*	Days of use	0.00 (-0.20,0.19)
2	Brooks (2010)	High	Self-guided therapy (parallel)	Drugs	RT supplements in-person	Days of use	0.01 (-0.76,0.79)
3	Johansson (2021)	High	Self-guided therapy (parallel)	Alcohol	RT replaces in-person	Days of use	0.212 (-0.02,0.44)
4	Verduin (2013)	High	Other (game) (parallel)	Alcohol	RT supplements in-person	Relapse	1.25 (0.34-4.56)
5	Farren (2014)	High	Self-guided therapy (parallel)	Alcohol	RT supplements in-person	Days of use	0.32 (-0.35,1.00)
Most effective remote therapies (n=8)							
6	Gonzales (2014)	High	Remote recovery support (transitioning)	Drugs	RT replaces in-person	Relapse	0.10 (0.03,0.33)
7	Carroll (2014) SG	Some concerns	Self-guided therapy (parallel)	Mixed	RT supplements in-person	Relapse	0.35 (0.14-0.90)
8	Fals-Stewart (2010)	High	Self-guided therapy (parallel)	Mixed	RT supplements in-person	Days of use	-0.65 (-0.99, -0.32)
9	Gustafson (2014)	Highs	Remote recovery support (transitioning)	Alcohol	RT supplements in-person	Relapse	0.59 (0.35,0.99)
10	Paris (2018)	Some concerns	Self-guided therapy (parallel)	Mixed	RT supplements in-person	Days of use	-0.45 (-0.87,-0.04)
11	Christensen (2014)	Some concerns	Self-guided therapy (parallel)	Drugs	RT supplements in-person	Days of use	-0.41 (-0.72,-0.11)
12	Timko (2019a)	High	Remote recovery support (transitioning)	Mixed	RT supplements in-person	Days of use	-0.27 (-0.51,-0.02)
13	Campbell (2014)	Low	Self-guided therapy (parallel)	Mixed	RT replaces in-person	Days of use	-0.27 (-0.44,-0.09)

*RT = remote therapy

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3.3.3 Conditions that appear to be associated with greater effectiveness

Drawing on the intervention descriptions and author reflections using the ICA method and supplementing this with available qualitative evidence, we identified key conditions (i.e. intervention or implementation features) that were indicated to be or appeared to be associated with increased effectiveness. Many conditions were not able to be fully explored as few studies reported them, for example abstinence at baseline or the use of contingency management. The final conditions selected were those for which we were able to identify evidence from the studies and which appeared to distinguish between most and least effective remote therapies. Key factors explored in the sub-group analyses, intervention type, timing and substance targeted, were considered in this analysis but did not appear to distinguish between most and least effective interventions. Table 15 provides definitions and examples of evidence used to categorise cases for each of the conditions.

Table 15: Details of conditions

Condition name / description / *Definition*	Example(s) of evidence used for categorisation
High_Sev_DAUD Participants have indicators of higher severity drug/alcohol use disorder (DAUD). *All participants were diagnosed as having high severity DAUD or being dependent on drugs or alcohol (as opposed to having a diagnosis of mild drug or alcohol use disorder, or abuse)* OR *Participants included those with mild to severe DAUD, or severity was not described, but the study reported baseline indicators, qualitative markers or descriptions of higher severity.*	**All participants dependent:** 'Those who were eligible [to participate in the study] met the DSM-IV criteria for opioid *dependence* and met the FDA qualification criteria for buprenorphine treatment.' p4 (Christensen et al., 2014) **Population with qualitative marker of higher severity:** In the Paris et al. study participants could be diagnosed with either dependence or abuse, but the discussion section noted that the study population had '*long histories of substance use and psychiatric disorders*'. p1540 (Paris et al., 2018)
RT_Mot_Abstinence Remote therapy aims to motivate participants to become / remain abstinent. *Abstinence, as opposed to a reduction in use, is an explicit goal of remote therapy or overall DAUD treatment* AND	**Abstinence is explicit goal and motivational strategy used to support abstinence attainment:** 'Therapeutic Education System consists of 62 computer-interactive modules covering skills *for achieving and maintaining abstinence*, plus prize-based motivational *incentives contingent on abstinence* and treatment adherence' p2 (Campbell et al., 2014)

Remote therapy uses motivational strategies to support attainment of abstinence.	**Abstinence not explicit goal:** 'Internet-delivered CBT for *reducing alcohol use*' p1089 (Johansson et al., 2021) **Motivational element but not focused on abstinence:** 'At each visit, the RA confirmed that TES participants completed the requisite two modules and *paid $8 cash for each completed module*.' p229 (Brooks et al., 2010)
RT_Appropriate_Level Remote therapy provides appropriate level of support defined as: *Remote recovery support interventions which monitor both drug/alcohol use and protective factors weekly or more often for at least 12 weeks.* OR *Self-guided therapy which lasts for more than 5 weeks.*	**Remote recovery support:** 'Patients were expected to complete one 15-minute telephone call per week for 12 weeks [...] During each telephone session, patients completed the Risk Assessment Worksheet about substance use and compliance with treatment and mutual-help since the last call.' p26 (Timko et al., 2019a) **Self-guided therapy:** 'A set of 69 computerized topics (e.g., Self-Management Planning, Drug-Refusal Training, etc.) grounded in CRA (Budney & Higgins, 1998). Participants completed web-based topics each clinic visit *(three times a week) for approximately 30 minutes per visit [over 12 weeks]*.' p5 (Christensen et al., 2014)
Personal_touch Engagement with remote therapy supported by personal touch defined as: *Participants have at least some opportunity to discuss their remote therapy progress / experiences with a provider so that their individual preferences / concerns can be addressed.*	**Personal touch present:** 'Every other week, she met with a study therapist for about 30 minutes *to check in about her treatment goals and progress on the computer modules*.' p11 (Christensen et al., 2014) **Personal touch absent:** 'Many internet patients said they *missed [...] therapist contact*.' p1095 (Johansson et al., 2021)
Targeted Engagement with remote therapy is supported by targeting to match target population preferences or characteristics defined as: *Remote therapy is developed or adapted to meet the needs and/or preferences of a specific cultural group.*	**Targeted to support engagement:** 'CBT4CBT-Spanish is a cultural adaptation of a 7-session Web-based program for cognitive behavioral treatment (CBT) [...] the storyline included multiple culturally relevant experiences, such as immigration-related family separation. The narrator and characters were developed to resonate with Latino cultural values and concepts, including respeto (respect), confianza (trust), machismo, caballerismo, marianismo (gender-specific values), familismo (family orientation), fatalismo (fatalism), sabiduría (wisdom), and personalismo (value of

	interpersonal relationships)' p1536 (Paris et al., 2018)
	Absence of targeting: 'Counselors generally thought a similar computer-assisted training program would be useful but that changing the presentation strategy to include more culturally specific references and more "street" language would make it more effective for their clientele.' p233 (Brooks et al., 2010)
Supports_in-person Remote therapy explicitly aims to support participation in or engagement with in-person treatment and/or recovery support.	**Explicitly aims to support engagement with in-person treatment:** '[We] hypothesized that those who receive CACR [computer-assisted cognitive rehabilitation], compared with a control intervention, will have better treatment engagement (e.g., more positive participation in treatment, stronger therapeutic alliance), leading to a stronger commitment to treatment.' p89 (Fals-Stewart & Lam, 2010)
Motivate_other_services Remote therapy encourages participation in or use of other available services.	**Remote therapy encourages use of other services:** 'Information about social support services and resources were also sent to participants on the weekend and were tailored geographically to the participants' zip-code residence location reported at enrolment to the program.' p6-7 (Gonzales et al., 2014)

Table 16's data illustrates the presence (indicated by a 1) or absence (indicated by a 0) for each condition in each remote therapy intervention. In one study (Farren et al., 2014) we were unable to determine whether the inclusion criterion for participants was 'alcohol dependence' (i.e. higher severity) or 'alcohol abuse' (i.e. lower severity) since both descriptors were used at different points in the report; in line with QCA methods we coded it as 0.51, to indicate the ambiguity of the evidence.

Table 16: Data table of intervention features

Study	Most effective remote therapy	Higher Severity DAUD	RT Motivates abstinence	Appropriate level of RT	Personal touch	Targeted	Supports in-person treatment and/or recovery	Motivates use of other services
Lucht (2020)	0	1	0	0	0	0	0	0
Brooks (2010)	0	0	0	1	0	0	0	0
Johansson (2021)	0	0	0	1	0	0	0	0
Verduin (2013)	0	1	0	0	0	0	0	0
Farren (2014)	0	0.51	0	0	0	0	0	0
Gonzales (2014)	1	0	1	1	0	1	0	1
Carroll (2014)	1	1	0	1	0	0	0	0
Fals-Stewart (2010)	1	1	0	1	0	0	1	0
Gustafson (2014)	1	1	1	1	1	1	0	1
Paris (2018)	1	1	0	1	0	1	0	0
Christensen (2014)	1	1	1	1	1	0	1	0
Timko (2019a)	1	1	1	1	1	0	0	1
Campbell (2014)	1	0	1	1	1	1	1	0

3.3.4 Configurations of conditions associated with greater effectiveness

Configurations of the intervention and contextual conditions were examined in three QCAs. The QCA were built around emergent themes reflecting three overarching principles: 1) meeting treatment and recovery needs, 2) taking a person-centred approach and 3) supporting use of available services.

QCA 1: Meeting treatment and recovery needs

The first QCA comprises three conditions: a) participants have indicators of higher severity DAUD; b) the remote therapy aims to motivate abstinence; and c) the remote therapy offers an appropriate level of support. The Truth Table for this QCA (Table 17) illustrates the association between configurations of conditions in this QCA and the outcome sets. In the top 3 rows, the consistency score (including a measure of the strength of the sufficient relationship) of 1.00 illustrates a perfect association between the configurations in those rows and most effective cases – that is to say that all of the cases with configurations in the top three rows were most effective. Three of the eight most effective cases had a configuration with all three conditions present (as illustrated in the second row), whilst the remaining five had configurations with two conditions present (rows 1 and 3). In the final two rows a consistency score of 0.00 indicates a perfectly consistent association between these two configurations and least effective cases. The five least effective cases each had just one condition present – either higher severity DAUD participants (row 4) or an intervention offering an appropriate level of service (row 5). As such, all five least effective cases lacked the condition 'motivation to become or remain abstinent' as well as lacking one other condition.

Table 17: Truth Table for QCA 1: Meeting treatment and recovery needs

High_Sev_DAUD	Mot_Abstinence	Appropriate_Level	Out	n cases	Incl	PRI	Cases
1	0	1	1	3	1.000	1.000	Paris, Carroll, Fals-Stewart
1	1	1	1	3	1.000	1.000	Christensen, Timko, Gustaffson
0	1	1	1	2	1.000	1.000	Campbell, Gonzales
1	0	0	0	3	0.000	0.000	Farren, Lucht, Verduin
0	0	1	0	2	0.000	0.000	Brooks, Johannsen

Key: Out = Membership of most effective outcome set, n cases = number of cases in configuration, incl: sufficiency inclusion score – i.e. the proportion of cases with this configuration from the most effective set, PRI: proportional reduction in inconsistency

QCA 2: Taking a person-centred approach

QCA 2 is comprised of two conditions reflecting how remote therapies could support engagement by taking a person-centred approach: a) participants have at least some opportunity to discuss their remote therapy progress/experiences with a provider so that their individual preferences or concerns can be addressed, or b) remote therapy is developed or adapted to meet the needs and/or preferences of a specific cultural group. As the Truth Table (Table 18) shows, cases with one (rows 2 and 3) or both (row 1) of the conditions were all most effective. The table also shows that all five least effective cases had both conditions absent (row 4). However, there were two most effective cases with both conditions absent such that the final row of the Truth Table is contradictory. We explore possible explanations for these two contradictory cases in section 3.3.8.

Table 18: Truth Table for QCA 2: Taking a person-centred approach

Personal_touch	Targeted	Out	n	Incl	PRI	Cases
1	1	1	2	1.000	1.000	Campbell, Gustaffson
0	1	1	2	1.000	1.000	Paris, Gonzales
1	0	1	2	1.000	1.000	Christensen, Timko
0	0	0	7	0.286	0.286	Brooks, Carroll, Farren, Fals-Stewart, Johansson, Lucht, Verduin

QCA 3: Maximising service use

QCA 3 is comprised of two conditions reflecting ways that remote therapies could maximise participants' overall service use: a) by supporting engagement with in-person treatment and/or recovery or b) by motivating use of other available services. As the Truth Table (Table 19) shows, cases with either one the conditions were all most effective (rows 1 and 2). Whilst all five least effective cases had both conditions absent, two most effective cases also lacked both conditions such that the final row of the Truth Table is contradictory. We explore possible explanations for this in section 3.3.8.

Table 19: Truth Table for QCA 3: Maximising service use

Supports_in-person	Motivate-_other_service	Out	n	Incl	PRI	Cases
0	1	1	2	1.000	1.000	Gonzales, Timko, Gustafson
1	0	1	2	1.000	1.000	Campbell, Christensen, Fals-Stewart
0	0	0	7	0.286	0.286	Brooks, Carroll, Farren, Johanssen, Lucht, Paris, Verduin

3.3.5 Quality of the Truth Tables

The findings from QCA 1 (meeting treatment and recovery needs) demonstrate that all the most effective remote therapies offered an appropriate level of service in addition to either motivating abstinence or being delivered to those with higher severity. All five least effective interventions did not motivate abstinence and lacked one other

condition. The perfect consistency and complete coverage scores for QCA 1 show a strong relationship.

The findings for QCA 2 and QCA 3 do not show such a strong association since there were contradictory findings for one configuration in each QCA; whilst all the least effective cases lacked both conditions in each QCA, there were also two most effective cases in each QCA that lacked both conditions. Therefore, the findings should be interpreted cautiously as indicating that remote therapies *may* be more likely to be most effective if they a) take a person-centred approach (QCA 2), and b) maximise use of available services (QCA 3), but that these approaches may not always be required. However, whilst it is recognised in QCA that real-world phenomena rarely exhibit perfect consistency (Kahwati et al., 2016), there may also be plausible explanations for these apparent contradictions, see section 3.3.8.

3.3.6   Minimisation to identify the simplest solutions that best fit the data

QCA 1 – meeting treatment and recovery needs: Boolean minimisation, and the generation of an intermediate solution for QCA 1, identified two simplified pathways to most effectiveness as illustrated in Table 20 below. Pathway 1 involves an appropriate level of support and target those with higher severity DAUD. Pathway 2 involves an appropriate level of support and motivation of abstinence. Therefore, an intervention containing either configuration is sufficient to result in a successful outcome. Since both pathways contain an appropriate level of support, we can infer that this condition is necessary for obtaining a positive outcome. However, since both pathways also contain a second condition, we can infer that whilst an appropriate level of support is necessary, on its own it is not sufficient to trigger a successful outcome, a second condition is also required. Both configurations cover most instances of the outcome (some cases have characteristics supporting both configurations), and together they cover all the studies identified as members of the 'successful' outcome set.

Table 20: Minimised intermediate solution for QCA 1 – meeting treatment and recovery needs

Pathway/ Model	Minimised pathway descriptions (see notes)	Consistency	PRI	Raw Coverage	Unique Coverage	Cases
Pathway 1	Appropriate_Level *High_Sev_DAUD	1.000	1.000	0.750	0.375	Paris, Carroll, Fals-Stewart, Christensen, Timko, Gustafson
Pathway 2	Appropriate_Level* Mot_Abstinence	1.000	1.000	0.625	0.250	Campbell, Gonzales, Christensen, Timko, Gustafson
Model 1		1.000	1.000	1.000		

* = 'AND' relationship; Raw coverage: share of outcome covered by a configuration; Unique coverage: share of outcome uniquely coverage by a configuration. Only one model was generated as a solution (M1) with two pathways, suggesting no model ambiguity.

QCA 2 – taking a person-centred approach: The intermediate solution for QCA 2 identified two simplified pathways to most effectiveness as illustrated in Table 21 below. The first involves the personal touch condition only and second involves the targeting condition only. We can therefore infer that either condition is sufficient to trigger a positive outcome, but neither condition is necessary. Each configuration covers half of the instances of the outcome, but overall the model covers only six of the eight studies identified as members of the 'successful' outcome set.

Table 21: Minimised intermediate solution for QCA 2 – taking a person-centred approach

Pathway/ Model	Minimised pathway descriptions (see notes)	Consistency	PRI	Raw Coverage	Unique Coverage	Cases
Pathway 1	Personal touch	1.000	1.000	0.500	0.250	Campbell, Christensen, Timko, Gustafson
Pathway 2	Targeting	1.000	1.000	0.500	0.250	Campbell, Gonzales, Gustafson, Paris
Model 1		1.000	1.000	0.750		

QCA 3 – maximising service use: The intermediate solution for QCA 3 identified two simplified pathways to most effectiveness as illustrated in Table 22 below. The first involves only the supporting in-person treatment and/or recovery condition and the second involves only the motivating use of other available services condition. We can infer that either condition is sufficient to trigger a positive outcome, but neither condition is necessary. Both configurations cover fewer than half of the instances of the outcome, and overall the model does not contain all the studies identified as members of the 'successful' outcome set.

Table 22: Minimised intermediate solution for QCA 3 – maximising service use

Pathway/ Model	Minimised pathway descriptions (see notes)	Consistency	PRI	Raw Coverage	Unique Coverage	Cases
Pathway 1	In_person	1.000	1.000	0.375	0.375	Campbell, Christensen, Fals-Stewart
Pathway 2	Motivate_other_services	1.000	1.000	0.375	0.375	Gonzales, Timko, Gustafson
Model 1		1.000	1.000	0.750		

3.3.7 Consideration of logical remainders

Here we consider the likely outcomes of possible configurations for which we identified no examples, known as logical remainders. For all three QCAs, the logical remainders were not useful in simplifying the complex solution as there was no difference between the complex and the intermediate solution. However, below we provide our hypotheses about the likely outcomes of logical remainders.

QCA 1 – meeting treatment and recovery needs: As Truth Table 17 illustrates, our cases represented five of the eight possible configurations for a three-condition QCA. We identified no cases with: all three conditions absent; both higher severity DAUD and an appropriate level of support absent; or higher severity DAUD and motivation of abstinence present, but an appropriate level of support absent. Since all the most effective cases had an appropriate level of support present, it seems likely that remote therapies that lack this condition would likely be least effective. Since all three logical remainder configurations lack this condition, we hypothesise that they would likely be associated with least effectiveness.

QCA 2 – taking a person-centred approach: Truth table 18 illustrates that we identified examples of all four possible configurations for a two-condition QCA; there are no logical remainders for this QCA.

QCA 3 – maximising service use: Truth table 19 illustrates that we identified three of the four possible configurations. The one logical remainder was a configuration with both conditions present; that is, a remote therapy that supports engagement with in-person treatment and/or recovery support and motivates use of other available services. Given that either one of these conditions appears sufficient to trigger most effectiveness we assume that the presence of both conditions would also lead to most effectiveness.

3.3.8 Interpretation of the solutions

Within-case analysis: Explanations for contradictory cases

Here we consider possible explanations for the three contradictory cases in QCAs 2 and 3. The remote therapy evaluated by Carroll et al. (2014) was found to lack both conditions in both QCAs 2 and 3. However, its status as a 'most effective' case is not clear cut. Both days of use and abstinence outcomes were measured, but the intervention was only found to be most effective for abstinence; findings for days of use were non-significant. The QCA analysis only focussed on the most and least effective, with remote therapies that were moderately in/effective excluded; developing further case knowledge of Carroll et al. (2014) means that its inclusion in the analyses as a most effective intervention is questionable and, as such, we excluded Carroll et al. (2014) from our consolidated analyses. However, it is well reported that trialists are reticent to report implementation and contextual features because the RCT

is seen as a highly controlled and standardisable method, allowing interventions' replication. As such, it is possible that the intervention evaluated by Carroll et al. (2014) may have included features from QCAs 2 and 3 but as they did describe we have not considered these features to be present in the QCA.

The intervention evaluated by Fals-Stewart and Lam (2014) was found not to feature either of the conditions in QCA 2 (targeting or personal touch). However, the self-guided therapy intervention in this study is qualitatively different from other self-guided therapy interventions in that it was designed to address cognitive impairment prior to treatment to enhance treatment engagement, rather than to address DAUD directly. There are two possible explanations as to why targeting or personal touch may not be required for this type of intervention. First, cognitive training prior to treatment may offer an alternative route to supporting engagement, this is certainly the hypothesis of the authors who suggest that 'participation in cognitive rehabilitation would lead to better treatment engagement (e.g., stronger therapeutic alliances, increased positive participation in treatment) because people would be more able to learn and use information presented as part of therapy, and as such, be able to engage more effectively with providers' (p88) (Fals-Stewart & Lam, 2010; Wells et al., 2012). Second, given the focus on cognitive rehabilitation rather than DAUD per se, cultural or individual preferences may be less relevant.

The remote therapy evaluated in Paris et al. (2018) involves neither condition relating to maximising service use (QCA 3). This study delivered 'CBT4CBT Spanish' – a culturally adapted version of the CBT4CBT intervention evaluated by Carroll et al. 2008. A possible explanation why supporting engagement with treatment or motivating use of other services may not have been relevant in the context of the Paris et al. (2018) trial is that the cultural appropriateness of the intervention was the factor most needed to support engagement. Other in-person treatment may be less appealing or useful to this group than the culturally adapted remote therapy, since those receiving it were less likely to attend in-person group sessions.

Cross case analysis: Examination of the least effective cases

Examination of the data table (Table 16) illustrates that the least effective remote therapies generally have fewer conditions present. Examination of the Truth Tables reveal the key configurations of conditions missing from the least effective cases. In QCA 1, the remote therapies evaluated by Farren et al. 2014, Lucht et al. 2013, and Verduin et al. 2020, share the same configuration in that whilst they are all delivered to participants with higher severity alcohol use disorders (AUDs), they do not aim to motivate abstinence and they do not offer an appropriate level of support. In terms of the level of support offered, Farren et al. 2014 offered self-guided therapy but the programme was just four weeks long. Lucht et al. 2020 offered remote recovery support in the form of a regular text message asking participant to respond to the

question 'did you drink or do you need help?' meaning that the intervention failed to monitor both alcohol use and protective factors. Lastly, the remote therapy evaluated by Verduin et al. (2013) was in the form of a game and did not meet the definition for self-guided therapy as it did not provide a series of modules to work through, but rather mini-games in which participants rehearse relapse prevention skills. The analysis for QCA 1 suggests that offering an appropriate level of support is a necessary component of the principle of meeting treatment and recovery needs; the remote therapies in these three studies appear to be too minimal to be effective.

Whilst the remaining two least effective remote therapies offered an appropriate level of support, they lacked the other two conditions in QCA 1 (Brooks et al., 2010; Johansson et al., 2021). As such they provide evidence that whilst an appropriate level of support may be necessary for successful outcomes, on its own this condition is insufficient to achieve this.

Moreover, all five of the least effective remote therapies did not offer a person-centred approach (QCA 2) and did not maximise service use (QCA 3). In terms of taking a person-centred approach, providers of the remote therapy evaluated by Brooks et al. (2010) noted that a lack of cultural adaptation may have undermined engagement with this intervention. Johansson et al. (2021) suggest that a lack of a personal-touch may have undermined engagement as many participants, who only communicated with therapists via asynchronous messages, "said they missed other forms of therapist contact" (p1095). In terms of maximising service use, whilst four of the five least effective remote therapies were delivered parallel to treatment and/or recovery support (Brooks et al., 2010; Farren et al., 2014; Verduin et al., 2013), they were not designed to support engagement with treatment. For example, Brooks et al. (2010) note that the treatment program and the clients' in-person counsellors had no involvement in the TES training and that feedback from counsellors was that ordering the modules to correspond with specific tasks that clients needed to complete at various stages of in-person treatment would be useful (p.235). Similarly, none of the least effective remote therapies motivated use of other available services, which appears to be particularly important for remote recovery support interventions such as Lucht et al. 2020.

By contrast, all of the most effective remote therapies, aside from Carroll et al. 2014 (see explanation above), provided an appropriate level of support and either took a person-centred approach and/or maximised service use.

Consideration of cases that are neither least nor most effective: Remote Talking Therapy Interventions

It is notable that none of the eight remote talking therapy interventions included in the meta-analysis (n=6 studies) met the criteria to be included in either the most effective

set or least effective set. There are several explanations for their minimal/moderate effect.

Two of the eight remote talking therapy interventions were delivered as a replacement for in-person treatment and found that these led to no worse effects (McKay et al., 2004; Wolitzky-Taylor et al., 2018). The intervention evaluated by Wolitzky-Taylor et al. (2018), which was delivered as a partial replacement for in-person care, had a non-significant positive effect on days of use. The intervention evaluated by McKay et al. (2004), which was delivered as a replacement for fairly intensive in-person transitioning care, had a very slightly negative effect on days of use relative to controls, but the difference between groups was again non-significant. As such, while these interventions were not 'most effective', they appear to have met the objective of being non-inferior to in-person treatment and/or recovery support.

The remaining six remote talking therapy interventions were delivered as a supplement to in-person treatment and/or recovery support and should therefore be expected to show superior outcomes to controls (Farabee et al., 2013; Graser et al., 2021; McKay et al., 2010, 2013). The outcomes achieved by the moderate in/effective remote therapies could be explained by the fact that none met the conditions for all three of the QCAs (as associated with most effectiveness), nor did they meet none of them (as associated with the least effectiveness). With regards to QCA 1 (meeting treatment and recovery needs), although all were transitioning interventions, and therefore possibly aiming to play a similar role as remote recovery support, none offered monitoring of consumption and protective factors at least weekly for at least 12 weeks (as defined as an appropriate level of service for remote recovery support) by failing to meet this condition they fail to reflect either of the two pathways identified in QCA 1. Since no remote talking therapies were included in the most or least effective set, we were unable to determine the appropriate level of service for this type of intervention. However, all but one of the remote talking therapies included in the meta-analyses (n=7) were brief, i.e. 30 minutes or less. Additionally, most had content similar to remote recovery support interventions, with the addition of some brief encouragement, counselling or CBT. It is possible that remote talking therapies offering interventions equivalent in duration and content to in-person talking therapies may be more effective.

With regards to QCA 2, we assume that, since they all involved synchronous talking therapy, they could respond to individual needs and preferences to some extent, such that they could be considered as offering 'a person-centred approach'. In relation to QCA 3, three remote talking therapy interventions 'maximised service use' by encouraging participation in outpatient and/or mutual aid groups; three did not.

Most of the remote talking therapy interventions (n=7) were delivered when transitioning to a less intensive phase of treatment or recovery support, whilst three

were delivered parallel to new or ongoing treatment and/or recovery support. It may be that remote transitioning interventions are generally more likely to be moderately in/effective; of the 22 transitioning interventions included in the effectiveness syntheses, only two were categorised as most effective and two as least. The remaining 18 were assessed as moderately in/effective.

3.3.9 Consolidated QCA: comprising all three principles

To help interpret the relationships between the three principles we produced a consolidated QCA with four conditions. Two conditions reflect the two pathways to successful outcomes indicated from QCA 1, i.e. 1) an appropriate level of service AND participants with higher severity or 2) an appropriate level of service AND motivation of abstinence. Conditions 3 and 4 reflect the pathways for person-centred interventions (cultural targeting OR personal touch) and for maximising service use (supports engagement with in-person treatment and/or recovery support OR motivates use of other services).

We excluded Carroll et al. (2014) from the consolidated QCA based on our learning and deepening case knowledge from conducting the previous QCAs. We initially ran the consolidated QCA both with and without the study; but because we found that solutions were highly skewed by the influence of this intervention, and because of its questionable status as a most effective remote therapy (see within case analysis above) we felt the solutions without this case were more informative and more representative of the body of evidence.

The Truth Table (Table 23) illustrates how the 12 cases all assumed one of four configurations; all of which showed perfect consistency and coverage.

Table 23: Truth table for consolidated QCA

Appropriate Level with High_Sev_DAUD	Appropriate Level with Mot_Abstinence	Person Centred	Maximising Service Use	Out	n cases	Incl	PRI	Cases
1	1	1	1	1	3	1.000	1.000	Christensen, Timko, Gustaffson
0	1	1	1	1	2	1.000	1.000	Campbell, Gonzales
1	0	1	0	1	1	1.000	1.000	Paris
1	0	0	1	1	1	1.000	1.000	Fals-Stewart
0	0	0	0	0	5	0.000	0.000	Brooks, Johannsen, Farren, Lucht, Verduin

Table 24 illustrates the simplified solution for the consolidated QCA. These consolidated findings represent our preferred solution.

Table 24: Minimised intermediate solution consolidated QCA

Pathway/ Model	Minimised pathway descriptions (see notes)	Consistency	PRI	Raw Coverage	Unique Coverage	cases
Pathway 1	Appropriate_Level with High_Sev_DAUD * Person Centred	1.000	1.000	0.571	0.143	Paris, Christensen, Timko, Gustafson
Pathway 2	Appropriate_Level with High_Sev_DAUD * Maximising service use	1.000	1.000	0.571	0.143	Fals-Stewart, Christensen, Timko, Gustafson
Pathway 3	Appropriate_Level with Mot_Abstinence * Person Centred * Maximising service use	1.000	1.000	0.714	0.286	Campbell, Gonzales, Christensen, Timko, Gustafson
Model 1		1.000	1.000	1.000		

* = 'AND' relationship; Raw coverage: share of outcome covered by a configuration; Unique coverage: share of outcome uniquely coverage by a configuration.

When we ran minimised solutions for the negation of the solution (i.e. pathways assumed by the least effective cases) we identified four possible pathways to least effectiveness that all showed perfect consistency and coverage. That is to say that the software identified four different ways that least effective remote therapies could be described:

- They included neither pathway regarding meeting needs – i.e. they neither had 'Appropriate_Level with High_Sev_DAUD' nor 'Appropriate Level with Mot_Abstinence'
- They lacked the pathway 'Appropriate_Level with High_Sev_DAUD' and lacked a person-centred approach
- They lacked the pathway 'Appropriate_Level with High_Sev_DAUD' and did not maximise service use
- They lacked a person-centred approach and did not maximise service use

These consolidated findings suggest that remote therapies which reflect at least one of the pathways to meeting needs in addition to taking a person-centred approach and/or maximising service use will likely achieve better outcomes than those which do not.

3.3.10 Conclusion

We identified three key principles that appear to distinguish between the most and least effective remote therapies. The QCA findings were strongest for the first principle – meeting treatment and recovery needs. The QCA findings for the second (taking a person-centred approach) and third (maximising service use) principles should be interpreted cautiously since not all the effective remote therapies met their conditions. Our consolidated QCA findings covering all three principles indicate that for remote therapies to be most effective it is essential that they meet treatment and recovery needs, but to increase the likelihood of successful outcomes they should also take a person-centred approach and maximise service use. Additional studies identified in the update searches were broadly consistent with these findings; see Appendix 5 for details.

3.4 Analysis 3: Population Equity

3.4.1 Summary of population equity analysis

- **Analysis 3 aimed to address the question:** Are changes in drug/alcohol use resulting from remote therapies consistent across different population groups?
- This analysis revealed gaps in knowledge relating to vulnerable groups and extremely limited evidence about the differential impact of remote therapies for population sub-groups.
- Most studies (n = 44/49) employed eligibility criteria to exclude particular groups. Notable exclusions were people with mental health conditions (n=34) and those without access to digital technology (n=14). The exclusion of potentially vulnerable sub-groups limits understanding of the suitability of remote therapies for these groups.
- The age and gender of participants were reported universally. Ethnicity was reported in 42 of the 49 studies. Some characteristics, such as education, were reported in an inconsistent way, precluding comparisons across studies. Others, such as socioeconomic status, were only reported in a minority of studies.
- Only four of the 29 studies included in the meta-analyses in Analysis 1 reported outcomes according to key population equity characteristics.
- We were unable to identify patterns of association between key equity characteristics and the most/least effective remote therapies due to a lack of variation of populations within the studies in this analysis.

3.4.2 Studies' exclusion criteria

As reported in section 2.8.1, we extracted data on criteria applied in the 49 included studies to exclude particular groups of people. Table 25 lists the different types of exclusion criteria and the number of studies employing each. Five studies did not report any exclusion criteria; the details are therefore based on the remaining 44 studies. Most studies reported exclusion criteria related to drug and alcohol use (n=45) and drug and alcohol treatment (n=38). Many studies (n=34) excluded participants with major mental health conditions such as psychotic disorders. Very few studies excluded pregnant women, physically disabled persons, and homeless persons. We also found 32 studies reporting exclusion criteria related to participants' inability to provide consent, non-adherence etc.

Table 25: Studies' exclusion criteria

Exclusion criteria	Frequency (N=49)
Drug and/or alcohol use related	45
Drug and/or alcohol treatment related	38
Mental health condition	34
Language	18
Medical conditions	16
Access to digital technology/digital literacy	14
In prison	11
Intellectual disability	8
Age	5
Pregnancy	6
Social network	5
Homelessness	4
Physical disability	2
Gender	1
Other	32
No explicit exclusion criteria	5

Age: The majority of the 49 included studies (n=44) were of a general adult population (≥18 years old). However, three excluded those over 65 years old (McKay et al., 2004, 2010, 2013). One study focused specifically on young people; participants had to be aged 12-25 years (Gonzales et al., 2014). In another study, participants had to be over 17 years (with no upper age limit) (Tiburcio et al., 2018).

Gender: In only one study was gender an exclusion criterion. This study focused specifically on male veterans (Verduin et al., 2013).

Language: Eighteen of the 49 studies had explicit criteria related to language. With participants having to be proficient in the language of the digital intervention under-investigation (most commonly English but also German (Graser et al., 2021), Spanish (Paris et al., 2018), and Swedish (Johansson et al., 2021).

Access to digital technology/digital literacy: Explicit criteria related to access to digital technology/digital literacy were found in 14 studies. Of these, 13 excluded people who did not have access to the internet or who did not own, or have access to, a phone (either mobile and/or landline depending on the intervention). These studies covered remote therapies delivered via a range of different modes (internet n=3, mobile SMS/text n=4, smartphone application n=2 and telephone n=4). It was notable that only two of the 13 studies (King et al., 2009; Moore et al., 2019) provided details of how many people were excluded based on these criteria. One reported that only 20% of those approached for their study of group counselling delivered via videoconferencing said they had access to a computer with an internet connection (i.e. 80% did not and were excluded on this basis) (King et al., 2009). In the other, more recent study, of mobile phone-based text 'aftercare', 7% (12/170) of the participants who did not meet study eligibility criteria were excluded on the basis that they had no mobile service (Moore et al., 2019).

There was also one study where, to overcome issues related to access to technology, the participants in the experimental groups were given a smartphone and six-month data plan, however, those who were unwilling to learn how to use a smartphone or to complete a survey using one were explicitly excluded (Scott et al., 2020). In this study, of the 4,809 people screened, 3,866 (80%) did not meet eligibility criteria, which included 266 of whom were not comfortable answering surveys on a mobile phone.

Given the lack of reporting, and the variation among those that do, it is challenging to draw conclusions regarding the impact that exclusions based on access to digital technology and digital literacy had on equity. However, it is likely that such exclusions will result in excluding the most vulnerable.

Mental illness: 34 of the 49 studies had some exclusion criteria related to mental illness. Most commonly, people with psychotic disorder/psychosis (n=16), suicide ideation (n=11) and/or bipolar disorder (n=9) were excluded. There was a distinction among these studies with some excluding people with active/acute/untreated mental illness (giving justification for the exclusion, for example that more intensive treatment was indicated), while other studies excluded those with a "history" or "ever diagnosis" of certain mental health conditions, with no clear justification for why.

Physical disability: Only two studies had explicit exclusion criteria related to physical disability; those with vision problems were excluded (Gustafson et al., 2014; Verduin et al., 2013). The latter study also excluded those without the manual dexterity necessary for operating a laptop computer.

Intellectual disability: In eight studies there was an explicit exclusion criterion related to intellectual disability. Most commonly this related to "cognitive impairment". It was not always clear how this was assessed, or how many people it resulted in being excluded.

Medical conditions: Sixteen studies had exclusion criteria related to medical conditions. It wasn't always clear what these were and/or how they were assessed. In such instances the criteria simply referred to "significant medical illnesses" (Bickel et al., 2008; Christensen et al., 2014), a "medical condition that precluded outpatient treatment" (McKay et al., 2004, 2010, 2013; McKellar et al., 2012) or "medical complications that would interfere with participation" (Moore et al., 2019). In other studies, those with a life expectancy of <12 months or "advanced stage medical disease" were excluded (Fals-Stewart & Lam, 2010; Lucht et al., 2021). Finally, there were a group of studies in which those who had medical conditions contraindicating pharmacological treatment were excluded (Carroll et al., 2018; Shi et al., 2019; Wenze et al., 2015).

Pregnancy: In six studies women were excluded if they were pregnant, or there was a "likelihood of pregnancy" (Bickel et al., 2008; Carroll et al., 2018; Christensen et al., 2014; Shi et al., 2019; Stoner et al., 2015; Wenze et al., 2015). In only one of these studies was the exclusion of pregnant women clearly justified (Wenze et al., 2015).

Prison: One study focused specifically on a prison population (hence those not in prison were excluded (Chaple et al., 2016). Ten other studies had specific exclusion criteria related to participants being in prison, or who were "at risk" of being incarcerated, for example due to their legal status, or who had legal cases pending meaning incarceration was likely during the study period.

Homelessness: Homelessness was an explicit exclusion criterion in four studies (McKay et al., 2004, 2010, 2013; Wenze et al., 2015).

Social network: In five studies those not able to provide the names, addresses, and telephone numbers of at least one (Timko et al., 2019a), two (Gustafson et al., 2014; McKay et al., 2004) or three contacts (McKay et al., 2010, 2013) were excluded.

Drug and/or alcohol use related: 45 of the 49 studies had explicit criteria around drug and/or alcohol use. Most commonly these related to excluding those who did not meet diagnostic criteria for the substance use disorder(s) that were the focus of the intervention. There was also a group of studies (n=12) in which participants who had not self-reported alcohol and/or illicit drug use – and/or had a positive urine screen - within a certain time frame were excluded (i.e. participants had to not be abstinent at study entry). The timeframe ranged from 14 days (Moore et al., 2019) to one year (DeMartini et al., 2018). Conversely, there was also a smaller group of studies (n=3) where participants had to be abstinent at study entry (Farren et al., 2014; Graser et al., 2021; King et al., 2014); again, the time frame varied (from ≥5days (Farren et al., 2014) to 30 days (King et al., 2014)). Other drug and/or alcohol use related exclusion criteria included not having an abstinence goal (Graser et al., 2021), not experiencing high levels of craving (Keoleian et al., 2013), not being at low to moderate severity of problem drug or alcohol use (Chaple et al., 2016; Tiburcio et al., 2018) and reporting

use of drugs that were not the focus of the intervention (including heroin (McKay et al., 2010, 2013) and/or use of other drugs (Stoner et al., 2015)).

Drug and/or alcohol treatment related: Thirty-eight studies had explicit criteria related to drug and/or alcohol treatment. These fell broadly into three different categories. The first category (n=10) encompassed minimum requirements for treatment adherence at study entry (and the exclusion of those who did not meet these). The minimum requirements varied by study and included criteria such as not staying in residential treatment for a least a week (Fals-Stewart & Lam, 2010; Godley et al., 2010); not completing detoxification (Farren et al., 2014) or not being counselling adherent (King et al., 2014). The second category of criteria (n=10) related to pharmacotherapy and the exclusion of either those who were not on pharmacotherapy (Bickel et al., 2008; Carroll et al., 2008, 2014, 2018; Christensen et al., 2014; Moore et al., 2019) or the exclusion of those who were on pharmacotherapy (or seeking it) (Campbell et al., 2014; Johansson et al., 2021; Kiluk et al., 2018; Lucht et al., 2021). The third category included a broad range of other criteria related to drug and alcohol treatment, for example not having a "regular treatment discharge" (p225) (Graser et al., 2021).

Other: In 32 studies there were "other" exclusion criteria. These commonly included intervention-related factors (such as not being able to provide consent, planning to move from the area, unreliable transport to the treatment centre etc.). One study excluded those where there was "Expected non-adherence to the planned assessments" (e.g. refusal to take part in the telephone follow-up) (Lucht et al., 2014). Several studies required participants to be able to read to at least sixth grade level.

3.4.3 Studies' included populations

Table 26 depicts the characteristics of the populations reported in each of the studies using the PROGRESS-Plus framework. Gender and age were reported in all studies, with the typical participant male and middle-aged (over 40 years). Most studies reported the place of participant recruitment such as hospitals or a residential facility rather than the actual place of residence. We could extract data on ethnicity from 42 studies and education status from 40 studies. Though a good number of studies have drug and alcohol use and treatment information, reporting was inconsistent such that collating information across studies was difficult. None of the studies reported religion or sexual orientation.

Table 26: Characteristics of studies' populations

PROGRESS-Plus	Frequency (N=49)
Place	49
Gender	49
Age	49
Drug and/or alcohol use related	46
Education	40
Race/Ethnicity	42
Other	40
Social capital	34
Occupation	30
Drug and/or alcohol treatment related	30
Disability	20
Socio-economic status	12
Digital related	3
Religion	0
Sexual orientation	0

Place (Rural/urban, country/state, housing characteristics): In most instances participants were recruited from some form of treatment centre located within urban areas. Very few studies recruited from other settings, such as from prison (Chaple et al., 2016), or a hospital transplantation centre (DeMartini et al., 2018). The housing situation of participants was reported infrequently (Lucht et al., 2014; Timko et al., 2019a, 2019b), with only two studies specifically reporting the proportion of homeless participants (Lucht et al., 2021; Timko et al., 2019b).

Gender: Gender was reported – in a binary way – by all 49 studies. There was one male-only study (Verduin et al., 2013). The remaining 48 included men and women but typically, women were in the minority. In 19 of the studies women comprised less than a third of the sample. In the other 30 studies the proportion of women was over a third but less than two-thirds. In no study did women make up more than two-thirds of the sample.

Age: All studies reported the age of participants, most commonly as a mean. We observed a clustering of mean age (40-<65 years) in 32 studies and lower mean age

(18-<40 years) in 18 studies. We found no studies with participants mean age >65 years.

Education: All but nine studies reported some measure of educational level of the participants. Measures included mean number of years in education, highest educational level, and completing high school. The use of different measures presents challenges to making comparisons across studies. Typically, participants had some education at school level, with university education being less frequently reported.

Race/Ethnicity: The ethnicity of participants was reported in all but seven of the included studies. Of note, was that six of the studies that did not report ethnicity were from among the eight that were conducted outside of the USA (and included those conducted in Ireland (Farren et al., 2014), Switzerland (Graser et al., 2021), Sweden (Johansson et al., 2021), Germany (Lucht et al., 2021; Lucht et al., 2014), and Mexico (Tiburcio et al., 2018)). The remaining study was conducted in the US and, though ethnicity was not reported, the study was specially focused on a Latino population (Paris et al., 2018). The race represented in most studies were White/Caucasian, Black/African American and Multi-racial. We found 11 studies reporting minority groups such as American Indian/Alaska native/Native Hawaiian/Pacific Islanders/Native American/Minority/Asian.

Social capital: Partnership/marital status was reported in 34 of the 49 studies. Most studies (n=27) reported participants' marital status. There were 17 studies with unmarried participants and in 10 studies, we found the inclusion of divorced/separated participants.

Occupation: Thirty of the studies reported the occupational status of participants, most commonly whether they were employed or not (with unemployment tending to be high). Only one study mentioned whether the study participants included pensioners or retired people (Farren et al., 2014;), while another grouped unemployed and disabled into a single category (DeMartini et al., 2018).

Disability: Disability was reported in 20 studies in an inconsistent way. We could identify nine studies each reporting some kind of depression or anxiety though it varied between past and current episodes. Few studies labelled participants as having general mental health symptoms (n=6), post-traumatic stress disorder (n=4) and antisocial personality disorder (n=3). We found one study specifically mentioned about cognitive impairment (Fals-Stewart & Lam, 2010). Although many studies excluded participants with psychotic disorders, we found a few studies reporting psychotic disorders including bipolar, suicide or psychological problems (Hubbard et al., 2007; Paris et al., 2018; Timko et al., 2019b; Verduin et al., 2013; Wenze et al., 2015).

Only one study reported chronic medical conditions in their included participants (Hubbard et al., 2007).

Socio-economic status: Only 12 studies included some measure of income, though as with educational level, the way in which this was measured varied. Some studies included monthly income while others captured whether participants were on public assistance or not.

Digital: Three studies reported digital-related factors of the participants such as using computers, owning a computer, access to internet and internet use (Brooks et al., 2010; Shi et al., 2019; Tiburcio et al., 2018).

Religion: None of the studies reported the religion of study participants.

Sexual orientation: None of the studies reported the sexual orientation of the study participants.

Drug and/or alcohol use related: Most studies (n=46) collected some information related to drug and/or alcohol use from the participants as part of baseline characteristics. Most studies reported drug and/or alcohol use ranging from current use, the past 28-30 days (n=16 studies), the past 90 days (n=4 studies), weekly use (n=2 studies) to years of use (n=8 studies).

Another drug and/or alcohol use characteristic was related to the point of study entry such as baseline urine test for drugs, abstinence at the study entry which was observed only in very few studies. We also noticed a range of abstinence measures other than at the time of study entry such as abstinent in the past 6 or 12 months.

There was some information about primary substance use, different type of substance used and severity of use.

A few studies included some data about diagnoses of drug and/or alcohol abuse or dependence, or adverse consequences etc. A few studies also collected data about drinking goals, readiness to reduce and self-efficacy.

Drug and/or alcohol treatment related: The 30 studies that reported drug and alcohol treatment related information were mostly about past treatment episodes. They varied from outpatient treatment, inpatient treatment and residential treatment. A few studies reported length of stay, methadone dose at baseline, prior detoxification, number of detoxification treatment episodes and Disulfiram treatment.

Other: In 40 studies there were "other" PROGRESS-Plus criteria. These often included criminal justice information such as probation or parole, referral through criminal justice system, number of arrests, criminality, drug and alcohol related offence and time in prison.

3.4.4 Studies' reporting of outcomes by sub-group

Only four of the 29 studies included in the meta-analyses in Analysis 1 reported whether intervention's effects on relapse or days of drug and/or alcohol use outcomes varied by key population equity-related characteristics (i.e. gender, age, ethnicity, mental health, or education) (Campbell et al., 2014; McKay et al., 2004, 2010, 2013). Due to the scant evidence available, rather than extracting the data, we report authors' interpretations of their findings. As such these findings should be interpreted with caution.

Evidence on differential effects was available in relation to gender, mental health status and ethnicity; no studies explored differential effects according to age or education.

Differential effects according to gender (n=3 studies)

Differential effects of remote therapies according to gender were explored in three studies, with mixed results (Campbell et al., 2014; McKay et al., 2010, 2013). No difference in the effect of remote therapies between men and women were found in the studies by Campbell et al. (2014) and McKay et al. (2013) (Campbell et al., 2015; McKay et al., 2014). However, in the study by McKay et al. (2010) in which two remote therapies (telephone monitoring only (TM) and telephone monitoring with contingency management (TMC)) were compared to treatment as usual (TAU), no differences between men and women were found for TMC, but TM was more beneficial than TAU only for women (Lynch et al., 2010; McKay et al., 2010, 2011). However, at later follow-ups, this differential effect was not seen.

Differential effects according to mental health status (n=4 studies)

Three studies reported the effects of remote therapy according to mental health status; the findings were mixed. In the study of TES by Campbell et al. (2014), those who screened positive for social anxiety at treatment entry were significantly more likely to achieve abstinence when receiving TES compared to TAU whilst no significant difference was seen among those who were not socially anxious (Marino et al., 2021). McKay et al. (2013) reported no significant differences in the effect of TMC or TMC with incentives over TAU, between those with days of depression and those without (McKay et al., 2014). Lastly, analysis from the McKay et al. (2004) study found life-time major depression was not related to drug and alcohol use outcomes (McKay et al., 2005).

Differential effects according to ethnicity (n=1 study)

The only study that assessed outcomes by ethnicity was the study by Campbell et al. (2014). No differences were found/reported in abstinence outcomes for those receiving TES compared to controls by ethnicity (Campbell et al., 2017).

3.4.5 Population characteristics associated with most and least effectiveness

Using the 13 studies included in QCAs for Analysis 2, we examined whether patterns of association could be discerned between three conditions reflecting key population equity factors – ethnicity, age and gender – and most and least effective remote therapies. Few studies included in this analysis focused on distinct ethnic, age or gender groups. We therefore determined thresholds for the conditions that reflected studies with a higher than average proportion of participants with particular characteristics. Table 27 details the conditions and their definitions.

Table 27: Conditions in the population equity analysis

Condition	Definition / description
Minority white study population	Study populations that were explicitly described as being less than 50% white. The need for 'explicit' description was because three studies did not report the ethnicity of participants (Farren et al. 2014, Johansson et al. 2021 and Lucht et al. 2020).
Mean age less than 40	Study populations with a mean age of less than 40 years. The selection of age 40 was somewhat arbitrary, but appeared to reflect the median age across study populations.
More than 34% women	Study populations with more than 34% women. This threshold was selected to reflect studies with a higher than average proportion of women.

The data table (table 28) below illustrates which studies met each of the three conditions reflecting equity markers (as indicated by a 1) or not (indicated by a 0).

Table 28: Data table population equity

Study (case)	Most effective	Minority white	Mean age less than 40	More than 34% women
Farren (2014)	0	0	0	0
Brooks (2010)	0	1	0	1
Lucht (2020)	0	0	0	0
Johansson (2021)	0	0	0	1
Verduin (2013)	0	1	0	0
Campbell (2014)	1	0	1	1
Paris (2018)	1	1	0	0
Christensen (2014)	1	0	1	1
Carroll (2014)	1	0	0	1
Fals-Stewart (2010)	1	0	1	1
Gonzales (2014)	1	1	1	0
Timko (2019a)	1	0	0	0
Gustafson (2014)	1	0	1	1
Total least effective	5	2	0	2
Total most effective	8	2	5	5

Just four cases had a minority white population; of which two were most effective and two were least effective. Whilst this evidence indicates no patterns in relation to ethnicity and outcomes, it is notable both most effective cases were culturally targeted, whilst both least effective cases were not (see QCA 2 in Analysis 2). This finding may indicate that remote therapies for minority ethnic populations may be less successful if not culturally targeted. However, more studies with minority ethnic populations would be needed to determine this.

No trends are apparent in relation to studies with a seemingly higher than average representation of women; five of eight most effective cases had more than 34% women, whilst two of the five least effective cases did. None of the cases involved exclusively female groups; just one case (Carroll et al. 2008) involved more women participants than men (60.4% women).

The findings for age were somewhat clearer, with five of the most effective cases and none of the least effective cases being delivered to populations with a mean age of less than 40 years. If we raised the threshold to a mean age of 43 years, we would find that all but one of the eight most effective cases would have met this threshold, whilst none of the least effective cases would. Calculating a mean of mean ages across the studies within each set we find that mean for most effective cases is 37 years, whilst for most effective cases it is 46.9 years. However, whilst there appears to be a clearer trend with regards to age as compared to gender and ethnicity, the findings are not entirely clear-cut.

Because no clear patterns across each condition were apparent, we did not develop a truth table to pursue the next stages of QCA. Our inability to discern patterns may be due to the lack of cases focused on distinct ethnic, age or gender groups or due to poor specification of thresholds for the conditions.

In sum, the evidence was not conducive to determining an association, or the lack of an association, between the gender, age, and ethnicity of populations and the outcomes of remote therapies. As the findings regarding ethnicity perhaps indicate, there are likely to be complex interactions between population characteristics and the features of remote therapies, such that discernible patterns of association between outcomes and population characteristics may never be clear cut.

3.4.6 Conclusion

Almost all studies had eligibility criteria that excluded particular groups. Although all studies reported participants' socio-demographic characteristics, these were not standardised to enable comparison. Very few studies explored outcomes according to population characteristics and the data was not amenable to QCA. As such, there remain gaps in knowledge relating to vulnerable groups and the differential impact of remote therapies for different groups. Similar issues with respect to population equity were evident in the additional studies identified in the update search; see Appendix 5 for details.

4 DISCUSSION AND CONCLUSIONS

4.1 Summary of findings

This systematic review examined evidence on: the effectiveness of remote therapies for reducing drug/alcohol use among treatment and recovery support populations (Analysis 1); the intervention, implementation and population features associated with greater reductions in drug/alcohol use (Analysis 2); and the nature of the evidence with regards to population equity (Analysis 3).

For Analysis 1, meta-analyses on supplementing in-person treatment and/or recovery support with remote therapies found that overall, it is an effective approach to reducing the likelihood of relapse and days of drug and/or alcohol use. Meta-analyses on replacing or partially replacing in-person treatment and/or recovery support components with remote therapies did not indicate that it leads to worse outcomes. Other reviews, albeit focused on specific types of remote interventions, or among non-dependent populations, also found evidence of effectiveness when offered as a supplement to in-person care, or no evidence of harm if replacing or partially replacing in-person care (Boumparis et al., 2019; Howlett et al., 2022; Kaner et al., 2017; Kiluk et al., 2019). However, like us, they also found heterogeneity of effect between individual studies.

Analysis 2 explored what intervention, implementation and population features were associated with more-or-less effective interventions. Others have previously noted a lack of understanding of, and need to further explore, how remote therapy interventions work and for whom (HM Government, 2021; Magill et al., 2023; Simpson, 2004). Although the analysis was hampered by limited description of intervention and contextual details in the trial reports, we identified three broad principles that appeared to characterise the most effective remote therapy interventions.

The first principle, meeting treatment and recovery needs, appears to be ensured by a) delivery to participants who have indicators of higher severity DAUDs, b) aiming to motivate participants to become or remain abstinent (rather than aiming to reduce consumption), and c) offering an appropriate level of service. For recovery support this involves monitoring of both consumption and protective factors at least weekly for at least 12-weeks, and for self-guided therapy this means an intervention of more than five weeks duration. We consider each of the conditions underpinning this principle below.

With regards to DAUD severity, research evidence shows that treatment engagement is motivated by beliefs pertaining to the severity of their drug/alcohol use disorder (DiClemente et al., 2004; Dillon et al., 2020). Our analysis appears to reflect this

phenomenon; i.e. that participants with more severe DAUD had greater intrinsic motivation to engage with treatment and recovery support, and that this intrinsic motivation may be needed to sustain engagement with remote therapy interventions. With regards to motivating abstinence, existing evidence demonstrates that commitment to abstinence may be a key factor in better drug and alcohol use outcomes (Kaminer et al., 2018; Mensinger et al., 2007). We determined the thresholds for 'appropriate level of support' inductively. For both types of intervention, remote recovery support and self-guided therapy, we identified indicators of a minimum threshold for a sufficient level of service (more than five weeks of self-guided therapy or weekly for at least 12 weeks for recovery support). For recovery support we were also able to identify minimum threshold for content, i.e. monitoring of both drug/alcohol use and protective factors. This is in line with findings from a previous review of DAUD monitoring which recommended: 'In addition to substance use, we suggest the inclusion of some indicators of recovery, such as lifestyle or behavioural changes. In order to fully assess symptom remission, questions about cravings, risk, and positive recovery signs such as coping, work, and positive social interactions may be useful' (p242) (Goodman et al., 2013).

The content of self-guided therapy interventions appeared to be relatively consistent across all interventions, such that we were unable to identify key content conditions that distinguished between most and least effective self-guided therapy interventions. This may be because self-guided therapy interventions are well-established with a long-standing evidence-base, such that all interventions meeting the criteria for categorisation as a self-guided therapy (a structured programme containing different activities that participants work through themselves) met the content threshold.

The second principle, taking a person-centred approach, appears to be ensured by either targeting to address the needs of a specific cultural group or tailoring to meet individual needs and preferences. Numerous meta-analyses have established the superiority of culturally adapted interventions in related areas. A 2022 meta-analysis of culturally adapted digital mental health interventions found a large positive significant effect across a range of outcomes when compared to wait-list and treatment as usual control conditions (Ellis et al., 2022). A 2017 review of 'culturally sensitive substance use treatments for racial/ethnic minority youth' found that they were associated with significantly larger reductions in post-treatment substance use levels relative to their comparison conditions (g = 0.37, 95% CI [0.12, 0.62], k = 7, total number participants = 723) (Steinka-Fry et al., 2017). Similarly, evidence from systematic reviews (Milward et al., 2018) and realist reviews (Shams et al., 2021) indicates that tailoring DAUD interventions to meet individual preferences and needs is also efficacious.

Findings on the third principle, maximising service use, show that remote therapies that either support engagement with in-person treatment and/or recovery support or

encourage use of other available services are likely to be more effective than those that do not.

Analysis 3 revealed that almost all the included studies had eligibility criteria with the potential to exclude vulnerable sub-groups such as those with mental health conditions, or those that are digitally excluded. At least some socio-demographic characteristics were reported for all study populations, although which characteristics and how they were measured varied; gender, age and ethnicity were most commonly and consistently reported. Very few studies explored whether intervention effects varied between population sub-groups; no clear patterns could be seen. We were unable to discern clear patterns of association between key equity characteristics and intervention effects using QCA. Others have noted a lack of evidence around underserved or vulnerable sub-populations, particularly those with comorbid mental health issues (Boumparis & Schaub, 2022; O'Donnell et al., 2022). This is a particularly pertinent issue given that in the UK, 70% of those accessing community drug treatment experience mental health problems (Black, 2020). A broader review of digital health technologies in general found inequities in access, particularly among non-white, non-English speaking populations and those with a disability (Woolley et al., 2023).

4.2   Strengths and limitations

A key strength of this systematic review is the rigour of the methods used. We conducted a comprehensive search of several databases, updated the search to ensure we included the most up-to-date evidence, and conducted meta-analyses to assess effectiveness. We used QCA to explore the heterogeneity of effects found within the meta-analyses, providing hypotheses of what aspects of interventions, their implementation and their target populations are associated with more-or-less effective remote therapies.

While reviews of effectiveness of remote therapies have been conducted previously, none focused solely on interactive interventions delivered parallel to new or ongoing treatment and/or recovery support, or when transitioning to a less intensive treatment or recovery support phase. Moreover, we identified distinct types and timings of remote therapies, which we explored through sub-group analyses, rather than combining all types together as has been the case in previous reviews. Additionally, through our QCA, we can explore more fine-grained hypotheses of how these interventions work, than is possible through a meta-analysis. Lastly, our review considered issues of population equity in relation to remote therapies, a factor that has received scant attention in previous reviews.

Nevertheless, there were limitations of this systematic review, particularly related to the studies included. As is the case with every systematic review, our work was

dependent on the evidence base available and we found that the quality, applicability and comprehensiveness of the evidence limited our analyses.

In terms of quality, most assessed outcomes were judged to be at high risk of bias (35/50). Only two outcomes, reported in a single study, were assessed as being at low risk of bias; the remaining 13 were judged to have some risk of bias. Predominant risks related to the use of self-report outcome measures, particularly for the 'days of use' outcome, and to missing outcome data. These concerns have also been noted by others, who recognise that such issues are inherent in evaluations of drug and alcohol treatment interventions (Boumparis et al., 2019; Dugdale et al., 2019; Howlett et al., 2022). Protocols were also commonly lacking, as noted by others (Howlett et al., 2022).

In terms of applicability of the review findings to the current English context, there are three main factors to be considered relating to: 1) the studies' location and population; 2) the comparators used; and 3) the nature of the remote therapies evaluated. In terms of location, no English studies were included in this review, and most were conducted in the USA. This may explain why many studies took place in treatment settings that are less typical of the English context. For example, many of the studies were conducted in inpatient settings, whereas virtually all treatment in England takes place in the community, with only 3% in inpatient and 1% in residential settings (Office for Health Improvement and Disparities, 2021). In terms of population, many of the studies targeted alcohol or a variety of substances, whilst opioids make up nearly half of the English treatment population (Office for Health Improvement and Disparities, 2023c). In terms of comparators used, the control arm in many of the studies differed from standard treatment and recovery support offered in English settings (Office for Health Improvement and Disparities, 2023b). That said, more than half (n=5/8) of the most effective remote therapies in the QCA were delivered to participants in community or outpatient settings, of which two were for those with opioid use disorder. Moreover, the mechanisms identified through the QCA are at a level which should be transferable across treatment contexts and populations.

In terms of the remote therapies evaluated, older studies in the review may be less applicable to current contexts. Remote therapies have evolved rapidly in recent years, as has people's experience and acceptance of them, particularly since the Covid-19 pandemic. It is notable that despite the ubiquity of mobile phones today, only three of the 49 studies in the overall review evaluated mobile apps. Additionally, in several of the studies the remote therapy evaluated was accessed on computers located within the treatment clinics. With widespread access to smartphones and online platforms, remote therapies would now be expected to be accessed at a time and place of participants' choosing. However, we do have at least some evidence; one study in the most effective set in the QCA evaluated a mobile app (Gustafson et al., 2014). Details of remote treatment interventions available in England are outline below. We then

consider how the review findings may apply to the predominant remote therapy in England (Breaking Free Online).

Before undertaking this review, we mapped what digital interventions were in use in England prior to the COVID-19 pandemic. We identified four interventions that could be used in parallel to a new or ongoing treatment phase (Breaking Free Online, The Capital Card, Flo and MyCarePath) and seven for use when transitioning to a less intensive phase of treatment or recovery support (AlcoChange Clinical, Down Your Drink, Drink Aware, Drink Coach App, HeLP-Alcohol, Lower My Drinking and Sure Recovery) (Burchett et al., 2022). Eight of these incorporated remote recovery support (AlcoChange Clinical, Breaking Free Online, Drink Aware, Drink Coach App, Flo, Lower My Drinking, MyCarePath, and SURE Recovery), two incorporated self-guided therapy (Down Your Drink, HeLP-Alcohol) and one did not fit the three intervention types (The Capital Card – an incentives programme). All the transitioning remote therapies were available for use by either anyone wishing to reduce their consumption, or people drinking at hazardous/harmful levels, rather than being exclusive to those moving to a less intensive treatment and recovery support phase. Five mutual aid remote support groups were also identified (Alcoholics Anonymous Online, Cocaine Anonymous Online, Marijuana Anonymous Online, Narcotics Anonymous Online, Smart Recovery Online), as well as four other interventions which involved peer support (Club Soda, Daybreak, Dry Days and Soberistas). It is likely that newer remote therapies have been developed for use since the COVID-19 pandemic.

Breaking Free Online, a remote recovery support intervention was the most mentioned digital intervention in a survey of providers and stakeholders in England in 2019 (Burchett et al., 2022). It incorporates CBT-based elements, with information and action planning, monitoring consumption and other factors, and other elements such as mindfulness and links to mutual aid groups. It is accessible 24/7, either online or via a mobile phone app and participants are encouraged to use it weekly for at least an hour, for at least eight weeks (Breaking Free Group & LifeWorks, 2022). In comparison to what we found in our analysis, regarding remote recovery support, BFO meets the content conditions for effectiveness, but not the length condition. It is possible that lengthening use from eight to twelve or more weeks could increase effectiveness. Extensive research has been conducted exploring its acceptability among participants and providers, factors associated with participants' and providers' engagement with it, its implementation and feasibility among a range of population groups (Hayhurst, et al., 2021; Elison-Davies, Wardell, et al., 2021, 2021; Neale & Stevenson, 2014; Ward et al., 2019). Two randomised controlled trials, one with a community outpatient population and another with a prison population, are currently underway to assess effectiveness (Elison-Davies et al., 2018; Quilty et al., 2022).

The included evidence base also did not reflect the need for intervention within prison populations and particularly continuity after release from prison. Only one included

study evaluated a remote therapy (self-guided therapy; parallel) in a prison population (Chaple et al., 2016). This was included in meta-analysis #4 but not in the QCA, suggesting it may be a moderately useful approach with this population, although more evidence is needed to confirm this. In terms of comprehensiveness, gaps in the data collected and reported in the included studies were a challenge that limited which intervention, implementation and population features could be incorporated into our analyses. Process evaluations were often not conducted in conjunction with included outcome evaluations and, when they were, they typically focused on quantitative measures of fidelity, retention and satisfaction. Rich qualitative data exploring how the interventions were experienced was not found for any study included in the QCA; indeed, for one study, the lack of information about the intervention's implementation and how it was experienced meant that we were unable to determine what hypotheses could explain its effect (Carroll et al., 2014). The included studies typically lacked baseline data on factors known to predict outcomes e.g. abstinence at baseline, motivation to change. This limited which characteristics we could include in the QCA. For example, we would have been interested in exploring the extent to which the remote therapies developed a sense of therapeutic alliance, their effect on engagement with remote and in-person treatment and recovery support, as well as understanding the role of baseline motivation to change and severity of drug/alcohol use disorder. However, these were not reported consistently in sufficient studies for us to incorporate in our analysis. Some conditions included in the QCA were necessarily crude, due to lack of detailed information provided in the studies. For example, if there was any individual-level interpersonal interaction between participants and providers (e.g. in review meetings, or within remote talking therapy), we assumed this would respond to their individual needs and preferences (i.e. configuration two), although whether this was the case in reality was rarely reported. The lack of process evaluations in this evidence base has been noted elsewhere (Howlett et al., 2022).

Heterogeneity was extensive in terms of the types, timing, terminology and content of the remote therapies, as well as what comparators studies used. As noted by others, this made synthesis and comparison between studies challenging (Burkinshaw et al., 2017; Nesvag & McKay, 2018). However, a strength of our analysis is that we recognised that there are distinct types and timings of interventions and we have incorporated this into our analyses (previous reviews have combined different types of remote or digital interventions, regardless of whether they were aimed at prevention or treatment/recovery, or whether they were self-guided therapy or remote recovery support) (Dedert et al., 2015; Meredith et al., 2015; Nesvag & McKay, 2018; Song et al., 2019). Conversely, there was a lack of heterogeneity in terms of the content of self-guided therapy interventions (as far as could be ascertained from their descriptions), in that several studies evaluated broadly the same content (e.g. CBT4CBT, Therapeutic Education System), albeit delivered in different ways or frequencies. As such, we

lacked evidence to make recommendations regarding the content of such interventions, although we note that most included some aspects of CBT.

We focused on relapse and days of use as our outcomes, since these reflected the most commonly-used outcomes reported in the studies. However, other outcomes, such as amount consumed, may have resulted in different findings being reached. It also neglects the other potential benefits of treatment and recovery support, such as improved health and reduced mortality, or increased social functioning. The lack of attention to non-abstinence outcomes (as well as intervention aims) has been noted elsewhere (Paquette et al., 2022), as has variation even within abstinence outcomes (e.g. recall period used) (Wiessing et al., 2018).

Another limitation is the fact that we used the most common outcome measure time point, which was at the end of treatment and recovery support (or nearest data point), to ensure we could include the maximum number of studies in our analyses. This meant that we did not examine evidence on the durability of outcomes after the interventions had ended. However, only a small number of studies reported the long-term effects of remote therapies. For example, only three studies measured outcomes 12 months or longer after the end of the intervention. Positive treatment effects appeared to be maintained in two of these when compared to control (Fals-Stewart 2010; McKay 2004) but were not maintained in the other (Timko 2019b). Other reviews have shown that many treatment and recovery support interventions are effective while the intervention is being delivered but no longer show evidence of effect at longer-term follow-ups (Boumparis et al., 2019). We also note that the included studies had varying durations of care, and that the remote therapy sometimes started at the same time as in-person care and sometimes started during or after it. The extent of this heterogeneity was such that we were unable to explore the effects of these factors in our analyses.

We were unable to include all identified studies in meta-analyses due to different outcomes reported, or lack of sufficient information to calculate an effect size (also noted by (Howlett et al., 2022)). We included ten remote talking therapy intervention evaluations in the review (approximately 20% of the included studies) and the same proportion of these were included in the meta-analysis were of this type. However, since no remote talking therapy studies were categorised as most or least effective, none were included in the QCA, meaning that we were unable to explore key features of these types of interventions. It may be that talking therapy relies on a strong therapeutic alliance, and that a strong therapeutic alliance is hampered to some degree by being delivered remotely. Alternatively, it may be that the remote talking therapy interventions were less successful because they did not address each of the key underpinning principles identified as important. By definition, remote talking therapies should be able to take a person-centred approach – the synchronous interaction between therapists and participants means they should be able to respond

to individual needs. As such it may be that addressing this factor enabled them to be fairly successful. However, since the talking therapy interventions did not meet the conditions relating to other key principles (i.e. meeting treatment and recovery needs, and maximising service use) they were relatively less successful than those in the most effective set.

4.3   Implications

There is potential for remote therapies to effectively support drug/alcohol treatment and recovery. Remote therapies appear to be more effective when they meet treatment and recovery needs, take a person-centred approach and/or maximise service use, and are less effective when they don't have these attributes. However, other factors that we were unable to explore may also be important: such as abstinence at baseline, motivation to change, therapeutic alliance and engagement with both remote and in-person treatment and recovery support. Future research should report these factors.

More RCT studies in England are needed to explore which remote therapies are most effective in this context. Evidence is also required on the needs of different cultural groups in the UK, to support targeting of remote therapies to ensure a person-centred approach. Internationally, more outcome evaluations are needed which include participants with comorbid mental health conditions, as well as marginalised groups. Evaluations should report differential effects for different population subgroups. Further research into existing interventions in the UK, such as Breaking Free Online, could test the hypotheses set out in our QCA findings. An international consensus is needed on a 'core outcome set' for drug/alcohol use treatment interventions. Although previous attempts have resulted in agreement that variation is necessary, consensus work is ongoing for some specific drug and alcohol use areas, such as overdose prevention/response, and brief alcohol interventions or for specific drug use disorders (cannabis, opioids) (*COMET Initiative: Core Outcome Measures in Effectiveness Trials*, n.d.; Donovan et al., 2012).

In addition to outcome evaluations, process evaluations are required, to help understand how and why interventions do (or do not) work in a particular context or with a particular population. Standardised RCT methods and indicators of quality have been agreed, however these are not always used. Ensuring future RCTs are conducted using these standardised methods and quality indicators will create a more useful evidence base in future. RCTs with long-term follow-up are also needed to provide insights into the sustainability of the benefits of remote therapies over time.

4.4   Conclusions

Remote therapies can be an effective approach to reducing the likelihood of relapse and days of drug and/or alcohol use, when supplementing in-person treatment and/or recovery support. Replacing, or partially replacing in-person treatment with remote

therapies does not appear to lead to worse outcomes but this evidence is not conclusive. There are limitations to the evidence in terms of robustness and relevance; most trials were found to be at high risk of bias, none were from the UK and many interventions and populations varied from those typically seen in the current English context.

Three key principles appear to distinguish between the most and least effective remote therapies: 1) meeting treatment and recovery needs, 2) taking a person-centred approach and 3) maximising service use. Our findings indicate that for remote therapies to be most effective it is essential that they meet treatment and recovery needs, but to increase the likelihood of successful outcomes they should also take a person-centred approach and maximise service use.

There are gaps in the evidence relating to the delivery of remote therapies to vulnerable groups and the differential impact of remote therapies for different groups.

5 DETAILED METHODS

5.1 Review questions

This systematic review sought to explore the effectiveness and critical features of remote therapies. The review involved three analyses to address the following research questions:

1. How effective are interactive remote therapies for reducing drug/alcohol use?
2. Which intervention and implementation features of remote therapies are associated with greater reductions in drug/alcohol use?
3. Are changes in drug/alcohol use resulting from remote therapies consistent across different population groups?

5.2 General methods

1. An analysis of intervention effectiveness: In Analysis 1 we sought to identify how effective remote therapies are for reducing drug/alcohol use. We gathered evidence on the extent to which interventions achieved two key outcomes, preventing relapse and reducing the number of days of use. We statistically synthesised the findings of those studies amenable to meta-analysis to identify the magnitude of effects and to identify those interventions with the most successful outcomes. A narrative account of the findings of studies not amenable to meta-analysis was undertaken.

2. An analysis of key intervention features: Analysis 2 sought to identify key features of interventions that were most successful at preventing relapse and reducing the number of days of use. This analysis used Intervention Component Analysis (ICA), drawing on information from process evaluations, outcome evaluations and theoretical literature to identify remote therapy and implementation features that authors indicated as being key to successful outcomes. We then employed Qualitative Comparative Analysis (QCA) to systematically test which combinations of indicated features were associated with greater reductions in consumption.

3. An analysis of population equity: In Analysis 3 we took an equity focus to identify whether intervention effectiveness was different for disadvantaged groups in comparison to the whole population. The initial work for this stage involved examining the characteristics of study participants, as well as study exclusion criteria to identify the types of people that remote therapies have, and have not, been evaluated with. The second stage involved examining whether there were associations between the types of participants and outcomes.

5.3   Stakeholder engagement

For the original map (Burchett et al. 2022) we convened an advisory group, comprising of experts from relevant academic disciplines and practice sectors. This group worked with the review team to identify relevant sources of literature and offered feedback on drafts of the map protocol and emerging findings. There was no public involvement in the project but extensive dialogue with OHID at key stages during the review ensured that it was tailored to policy-maker needs.

5.4   Study identification

Studies were identified from an evidence map, which preceded this review (Burchett et al., 2022), update searches of the map and additional searches to identify research on remotely-delivered non-digital interactive therapies (e.g. telephone-delivered counselling) that were outside of the scope of the original map.

The initial map update search was undertaken to identify papers on digital therapies published between March 2019 and June 2021, and as per the original search, was based on three concepts (1) drug use, heavy alcohol use, dependence, withdrawal or recovery; (2) digital technologies; and (3) intervention. The additional searches to identify remotely-delivered non-digital interactive therapies (e.g. telephone-delivered counselling) were undertaken during November and December 2021. Unlike the original map, this second search is focussed on treatment and recovery but excluded prevention. The additional search strategy was developed on the concepts of: 1) telephone, video, or remote support; 2) intervention, treatment, or service context; and 3) drug use or alcohol dependence.

The following resources were searched for the additional search:

Scholarly bibliographic databases: AMED (OVID), CENTRAL (Cochrane Library), CINAHL (EBSCO), EMBASE (OVID), Health Management Information Consortium (OVID), Library, Information Science & Technology Abstracts (EBSCO), MEDLINE (OVID), PsycINFO (OVID), Scopus, Social Policy and Practice (OVID) SSCI, ESCI, CPCI (Web of Science).

Drug and alcohol research registries: Drug and Alcohol Findings (findings.org.uk), Alcohol Change UK, (https://alcoholchange.org.uk/research-hub/research).

Other databases and websites: NIHR-Health Technology Assessment Database (Canada and international HTA), NHS Evidence, Bielefeld Academic Search Engine, Proquest dissertations and theses, and NLTD theses.

Other: The EPPI-Reviewer database of the evidence map was searched to identify references that met the broader scope of remote therapies and that may have been excluded or deprioritized during screening of the evidence map.

Unlike the earlier evidence map conference proceedings were excluded from the searches, and we chose not to search trial registries since ongoing trials were not included.

The map update search strategy and additional search strategy was developed and implemented by the information specialist who conducted the original search (CS). An example search strategy is provided in Appendix 2. The new search was developed from analysing the text and concepts within 206 records from evidence map, and additional records screened for this review, plus checking the search strategy of two reviews Gates et al. (2016) and Tzelepis et al. (2019). We also checked Wikipedia and briefly searched Google to identify names for video telecommunication services. Furthermore, searches were run in Pubmed based on MesH terms to identify 14 papers to analyse MeSH terms via Yale MeSH analyser and to analyse the titles and abstracts of 790 records via Voyant tools (topics/ words in context/ word cloud).

These searches were subsequently updated to August 2023, see Appendix 5 for details.

5.5   Inclusion criteria

Table 29: Inclusion criteria

	To be included, studies had to focus on:
Participants	Adults: Aged 18+ In treatment: Those currently receiving treatment for drug or alcohol dependence*
Intervention	Remote therapies: Remotely delivered therapeutic interventions: a) that are delivered alongside or as a component of in-person treatment and/or recovery support for drug and/or alcohol dependence; b) that are delivered either online, by telephone or through a mobile application, and enable tailored interaction; c) with or without therapist involvement in the remote component; d) in which participants are supported to build their commitment, motivation and belief in their capacity to reduce or stop their drug/alcohol consumption; and e) in which participants are supported to develop a range of cognitive and behavioural skills and

	techniques, to support them in reaching their personal goals.
Comparison	Any type of comparator: i.e. a remote therapy may be compared to an in-person treatment and/or recovery support, to no intervention, or to alternative remote interventions.
Study design	Outcome evaluation: Any evaluations with a comparison group: randomised controlled trials (RCTs), non-randomised controlled trials (nRCTs) or controlled before-and-after studies Any type of process evaluation of a specific intervention (for Analyses 2 & 3 only): · administrative data (e.g. attendance) · observations (e.g. fidelity) · surveys (e.g. satisfaction) · qualitative interviews / focus groups (e.g. experiences)
Measures	Quantitative measures of consumption: Any quantitative measures of drug/alcohol consumption (e.g. self-reported units per week/drinking days, days abstinent, time to relapse, etc.) Qualitative or quantitative process measures (for Analyses 2 & 3 only): Any type – e.g. satisfaction, engagement, fidelity, experiences, preferences etc.
Geographical location	Contexts comparable to the UK: i.e. OECD countries
Date	Recent evidence: i.e. published in or after 2004
Language	Evidence accessible to the review team: i.e. published in the English language

*Because of study authors' inconsistent use of terminology regarding treatment and/or recovery support, acknowledged differences between the UK and other countries in delivery of services, as well the 'blurred line' between treatment, continuing care and recovery support provision (Office for Health Improvement and Disparities, 2023b) we had to develop rules by which to operationalise the criterion 'in treatment for dependence'.

Regarding 'dependence', we included studies in which participants were deemed eligible to receive an intervention consistent with the definition of treatment employed in the original map (Burchett et al., 2022) following a structured assessment. That is, we employed a working assumption that patients offered 'treatment' following a formal assessment must be dependent.

Regarding 'in treatment' we included studies a) where adults were already receiving a formal treatment service or b) where participants were recruited to receive an

intervention equivalent to formal treatment following an in-person assessment for eligibility.

5.6   Study selection

We removed duplicates and imported the search results into the systematic review software, EPPI-Reviewer (Thomas et al., 2020). We used a machine classifier to prioritise screening and automatically remove records of very low relevance, as had been trialled in a previous map (Stansfield et al., 2022; Thomas et al., 2020). We also ran searches within the original map review database to identify any references that were relevant to the expanded scope of this review but had been screened out for the original map because their intervention was remote but non-digital.

All the primary research papers from the map that had been coded as focused on treatment, and all the references from the updated and expanded searches, were screened on title and abstract using the inclusion criteria detailed in table 29. Full reports were obtained for those papers judged as meeting the inclusion criteria, or where there was insufficient information to assess relevance. We piloted the inclusion criteria and screening process by comparing decisions in groups of two or more reviewers using worksheets with guidance notes on a small sample of records (e.g. 10-20). Disagreements were resolved through consensus and any required refinements to the criteria were made and recorded in a working protocol document. For both title and abstract and full-text screening a sample of records were screened by reviewers independently and differences resolved by discussion or consulting with a third reviewer. Once agreement rates were adequate (90-95%), the remaining records were screened by a single reviewer.

5.7   Assessing risk of bias

Outcome evaluations were assessed for risk of bias, specific to the outcomes included in the effectiveness syntheses, using the Cochrane ROB2 (Sterne et al., 2019). All assessments were conducted by at least two reviewers with differences resolved by discussion or consulting a third reviewer.

5.8   Data extraction

Key descriptive information was extracted from all included studies. Coding tools, involving the extraction of more detailed characteristics were developed for each review question and corresponding synthesis. The tools were piloted to ensure consistency and clarity. Data was extracted by two reviewers independently and differences resolved by discussion or consulting a third reviewer.

Examples of the types of data extracted from each outcome evaluation include:

- Study details: (e.g. date of publication, geographical location, study aims, study design).
- Population and setting details:
  · Ethnicity, occupation, gender, socioeconomic status (using the PROGRESS-Plus framework (Kavanagh et al., 2008))
  · Type of substance use (e.g. alcohol, drugs, substance use)
- Intervention details
  · Remote platform(s) used – e.g. telephone, text messaging, smartphone app etc.
  · Therapeutic approach – e.g. cognitive behavioural therapy (CBT), motivational interviewing
  · Length, frequency and intensity of intervention
  · Details of treatments and recovery support interventions delivered alongside the remote therapy (e.g. medication, monitoring, counselling etc.)
- Study methodology (e.g. sample size, follow-up period, data collection methods.)
- Findings (e.g. outcome data, process data).

Because studies did not use consistent terminology and there was wide variation in content, frequency and intensity of interventions, we grouped them into three broad 'types' of intervention based on the nature of what was provided (remote recovery support, remote talking therapy or self-guided therapy); see table 2 for definitions of these categories.

The interventions were also grouped according to their timing in relation to in-person treatment or recovery support (parallel to a new or ongoing in-person treatment and/or recovery support phase, or when transitioning to a less intensive phase of treatment or recovery support, hereafter 'parallel' or 'transitioning' interventions).

'Transitioning' interventions were typically delivered following discharge from in-patient treatment or from intensive outpatient treatment to less intensive outpatient treatment. Although they were often described as either 'aftercare' or 'continuing care' their extent and intensity could be similar or even greater than 'parallel' interventions, reflecting the 'blurred line' between treatment, continuing care and recovery support provision and differences between the UK and other countries (Office for Health Improvement and Disparities, 2023b). See definitions in table 2.

Separate categories for type and timing were used because intervention content, approach, and/or intensity were not consistent with respect to timing. For example, interventions classed as 'remote talking therapy' could be delivered parallel to new or ongoing in-person treatment and/or recovery support or when transitioning to a less intensive phase of treatment or recovery support. The tools were piloted to ensure consistency and clarity. Full details of these tools can be found in section 5.8. Data was

extracted by two reviewers independently and differences resolved by discussion or consulting a third reviewer.

For process evaluations not linked to included outcome evaluations, information was extracted regarding the type (i.e. remote recovery support, remote talking therapy or self-guided therapy) and timing of the intervention (parallel to new or ongoing treatment and/or recovery support, or when transitioning to a less intensive treatment or recovery support phase) and what type of process data was gathered (i.e. quantitative implementation, satisfaction data and/or qualitative data). One reviewer (HB) extracted data, whilst another (KS) checked this for accuracy. Any disagreements were resolved through discussion.

5.9 Effectiveness synthesis methods (Analysis 1)

5.9.1 Selecting outcomes for synthesis

Included studies could report any type of outcome measures relating to drug and/or alcohol consumption. For the meta-analyses we identified which outcome measures were most common among included studies; these were relapse (i.e. abstinence not maintained) and days of use. We identified that most studies measured outcomes at the end of the intervention and that relatively few reported follow-up data after the end of the intervention. We therefore decided that for comparability we would extract outcomes at the end of the intervention, or at the closest time point to the end of the intervention where end of intervention outcomes were not reported. A narrative assessment of any follow-up outcomes is also provided.

Where available, we selected Intention To Treat (ITT) or modified ITT analyses (in which participants with missing outcome data was excluded from the analysis analyses) over per protocol analyses. However, if authors imputed values for participants with missing outcomes (e.g. missing data imputed as relapse) we used the authors' data.

We also examined variation in terms of comparisons, i.e. what the intervention group received and what it was being compared to. Comparisons broadly fell into two categories: a) studies which examined whether providing remote therapy as a supplement to in-person treatment and/or recovery support was more effective than providing in-person treatment and/or recovery support alone, and b) studies which examined whether remote therapy as a replacement or partial replacement for in-person treatment and/or recovery support was no less effective than in-person treatment and/or recovery support. The former analysis is akin to the idea of a 'superiority' analysis in which the intervention is assumed to be superior to the comparator; the latter analysis is akin to a 'non-inferiority' analysis in which the

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intervention is assumed to be no less effective than the comparator. With two types of analysis and two outcomes we were able to conduct four effectiveness syntheses. Table 30 below illustrates the nature of the four syntheses.

For each effectiveness synthesis we conducted a statistical meta-analysis of all relevant studies with suitable data. We also report on the findings of studies with relevant outcomes for the synthesis, but with data that was not amenable to meta-analysis, e.g. studies which did not report the standard error.

Table 30: Details of four effectiveness syntheses

Synthesis	Analysis type	Assumption	Intervention	Comparator	Outcome
1	Akin to superiority	Supplementing in-person treatment and/or recovery support with remote therapy will enhance its effectiveness	Standard in-person treatment and/or recovery support + remote therapy	Standard in-person treatment and / or recovery support	Relapse
2					Days of use
3	Akin to non-inferiority	When provided as an alternative or partial alternative to in-person treatment and/or recovery support remote therapy will be no less effective	Remote therapy	Standard in-person treatment and / or recovery support	Relapse
4					Days of use

5.9.2 Extracting data for effect sizes for meta-analysis

Quality assurance: Outcomes were extracted by two reviewers working independently and comparing findings with disagreements resolved by discussion.

Handling studies with multiple interventions: Several studies evaluated multiple remote therapy interventions; data was extracted from each study for each relevant intervention arm. Where multiple remote therapy interventions were compared to a single comparator, the sample size for the comparison group was split across the number of intervention arms, to avoid double-counting of participants (Higgins & Green, 2011).

Selecting data for intention to treat (ITT) samples: Where possible we extracted data for ITT samples (i.e. all those who were randomised to intervention or control groups regardless of whether they dropped out of the study) or modified ITT samples (i.e. all those who were randomized and who provided follow-up data) rather than per protocol analyses (i.e. where only results from those who fully engaged in the intervention are analysed). This supports understanding of real-world effectiveness, assuming that the level of engagement will vary.

Harmonising data: Where studies reported the inverse of the outcome (i.e. reporting rates of abstinence rather than rates of relapse, or reporting days of abstinence rather than days of use) the effect size was calculated using the original data, and then converted to be harmonised to relapse and days of use to produce the pooled estimate.

Calculating effect sizes and pooled estimate of effects: Odds ratios (OR) were calculated for dichotomous measures of relapse, and difference between means (SMD) were calculated for the continuous outcome of days of use. Effect sizes for each of the above outcomes from individual studies were combined using a random effects meta-analysis.

Assessing heterogeneity: Each synthesis was evaluated in terms of statistical heterogeneity, which was assessed through visual inspection of forest plots as well as I^2 statistic.

Sub-group analyses: Since we were unable to anticipate the kinds of variation we would encounter in terms of intervention type and timing; sub-group analyses were not pre-specified in the protocol. However, for meta-analyses with enough trials, we conducted sub-group analyses to explore whether outcomes varied according to all three key dimensions of difference: intervention type, substance type targeted and intervention timing.

5.9.3 Narrative synthesis methods

The findings of studies not amenable to meta-analysis are reported descriptively. For each study being synthesised narratively, we examined whether the study findings were consistent with the meta-analysis in terms of direction of effect, and whether the finding was statistically significant.

5.9.4 Assessing overall risk of bias

To understand the robustness of the syntheses we used the Cochrane RoB2 tool to assess the proportion of studies at high, medium or low overall risk of bias, contributing to each synthesis (Sterne et al., 2019). All assessments were conducted by at least two reviewers with differences resolved by discussion or consulting a third reviewer.

5.10 Intervention features synthesis methods (Analysis 2)

5.10.1 QCA stage 0: Selection of cases and specifying outcome sets

We selected cases and assigned them to outcome sets based on their effectiveness as follows.

Most effective set: For both the 'added to' and 'replace' analyses we selected all cases with a statistically significant positive effect - i.e. cases where there is little doubt that the intervention is superior to the control condition. For the 'replace' synthesis we could have included all cases where the confidence intervals cross the line of no effect as these studies indicate that the intervention is not worse than the thing it replaces (i.e. the control receive face-to-face). However, we felt we needed to focus in on those that were most effective (and if we had included all those shown to be no worse than in-person, we would have included all but one of the cases in the 'most effective' set and the other one in the least effective set – so no 'noise' cut out).

Least effective set: For cases in the 'added to' analyses we included all studies where the point estimate is on the 'not effective' side of the line of no effect, regardless of whether the confidence intervals cross the line. That is, we categorised cases of remote therapy added to face-to-face therapy as least effective where it appears that these interventions generally achieve worse outcomes than controls. However, for the 'replace' analysis we selected only cases where the point estimate is on the not effective side of the line of no effect and the confidence intervals do not cross the line of no effect. This is because, for this analysis we wanted to be confident that the remote therapy is worse than the face-to-face therapy it replaces.

5.10.2 QCA stage 1: Identification of conditions using ICA and building the data table

Following case selection and calibration of outcome sets we read and re-read the papers to develop deep case knowledge. Following this, two authors (KS and HB) independently extracted information about the nature and context of the interventions and about the populations to create a data table with cases represented in rows and conditions represented in columns (see Table 16). Intervention descriptions provided by the authors were examined in detail. We also examined linked papers, in particular any qualitative evidence, and the discussion section of trial reports, following the ICA approach (Sutcliffe et al., 2015), to gather informal reflections from authors about the critical intervention, implementation or contextual features. We used inductive qualitative analysis techniques to enable consistent coding of disparate information.

5.10.3 QCA stage 2: Constructing Truth Tables

A truth table is the primary analytic device of QCA. In the truth table the focus shifts from individual cases to groups of cases sharing the same outcomes 'outcome sets' (as described above) and from individual conditions to sets of studies with particular

configurations of conditions that lead to a particular outcome. We created a separate truth table for each of the three analyses conducted. The findings of these three analyses were the combined into an overall consolidated analysis.

5.10.4 QCA stage 3: Checking the quality of the Truth Tables

The truth tables were first checked for consistency in pattern of association between the configurations and the outcome sets. We checked that patterns of association were evident, and examined whether consistency scores generated by the software were 1 (i.e. perfect consistency) or very close to 1 (i.e. >0.85). Where patterns of association were contradictory, we sought explanations for this.

The second check assessed coverage, i.e. whether configurations are supported by multiple cases. As it is anticipated that there will be several paths to a given outcome, the coverage offered by any given configuration may only be a small number of cases or a single case. Where a QCA solution becomes an explanation of individual cases it offers little explanatory power. A third check examined whether there was a reasonable spread of cases across the possible configurations in each of our truth tables.

5.10.5 QCA stage 4: Boolean minimisation to identify simplified expressions of configurations

We used Boolean minimisation to identify simplified expressions of configurations. Configurations were simplified with view of maximising coverage of as many of the cases in the successful outcome set as possible and with high consistency. This initially generated what is known as the complex solution i.e. the longest, least parsimonious solution. We planned to use logical remainders to simplify the complex solutions and produce what is known as an 'intermediate' solution. However, for all three models, the logical remainders were not useful in simplifying the complex solution as there was no difference between the complex and the intermediate solution.

5.10.6 QCA stage 5: Consideration of "logical remainders"

Whilst logical remainders were not useful in simplifying the solutions, we nevertheless hypothesised the likely outcome of configurations for which there were no observed cases to help us with our interpretation.

5.10.7 QCA stage 6: Interpreting the solutions

Within case analyses focused on cases displaying apparently contradictory outcomes to identify possible explanations and add depth to the understanding of the solutions produced by the QCA. Cross-case analyses were conducted to examine if the groupings of studies within the QCA solutions distinguished between studies in a meaningful way. We also considered cases that were in neither the most, nor the least effective set to further understand and interpret the solutions.

5.11 Population equity methods (Analysis 3)

To better understand if certain disadvantaged groups were excluded from, and/or under-represented in, the included outcome evaluations, we undertook two related activities. First, we investigated the exclusion criteria that were reported by each study. We developed a data extraction tool following preliminary assessment of five studies, which was then tested on a further five. The exclusion criteria were then coded by two members of the team (WM and PD) and agreement reached. Second, we extracted equity-relevant characteristics of the populations reported in each of the studies using the PROGRESS-Plus framework. PROGRESS-Plus is an acronym of the axes of potential disadvantage which includes: **P**lace of residence, **R**ace/ethnicity, **O**ccupation, **G**ender/sex, **R**eligion, **E**ducation, **S**ocio-economic status and **S**ocial capital. The 'plus' refers to additional categories such as age, sexual orientation and disability (Kavanagh et al., 2008). Data was extracted into Excel by two members of the team (WM and PP).

To understand if the impact of remote therapies differed for different population groups, we adopted two strategies. First, we reviewed the studies included in the meta-analyses in Analysis 1 to ascertain whether they reported sub-group analyses exploring differences in the effect of remote therapies on relapse prevention or days of drug and/or alcohol use outcomes according to key population equity factors (gender, ethnicity, education, age and mental health status). Second, we examined whether patterns of association could be discerned between most and least effective remote therapies and the gender, age and ethnicity of participants.

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APPENDIX 1: CHARACTERISTICS OF INCLUDED STUDIES (N=49): AN OVERVIEW

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type Follow-up	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
1. (Bickel et al., 2008) USA Computerized Behavior Therapy for Opioid-Dependent Outpatients: A Randomized Controlled Trial	*To evaluate the efficacy of an interactive, computer-based behavioral therapy intervention, grounded in the community reinforcement approach (CRA) plus voucher-based contingency management model of behavior therapy, for individuals with opioid dependence*	**Population (N=135)** Adults meeting DSM-IV opioid dependence and FDA methadone treatment criteria Mean age: ~28 years **Gender:** ~55% male **Ethnicity** ~95% White Opioids	**Intervention (N=45)** Computer-assisted community reinforcement approach (CRA) treatment with vouchers **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=90)** 2 control arms: • Therapist - delivered CRA+ vouchers (N=45) • TAU** (N=45) Evaluation type Non-inferiority	Duration 6 months Follow-up Not reported	No usable data	No usable data

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
2. *(Brooks et al., 2010) USA Feasibility and effectiveness of computer-based therapy in community treatment	*To examine the effectiveness of TES plus reinforcement for completing modules and drug use compared it to a Usual Care control group*	**Population (N=26)** Adults from Outpatient (OP) program for drug and alcohol treatment Mean age: ~43 years **Gender:** 50% male **Ethnicity** 90-100% African American 8% White Cocaine	**Intervention (N=14)** Therapeutic Education System (TES) **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=12)** Yoked control (TAU + incentives tied to intervention arm participant) Evaluation type Superiority	Duration 8 weeks Follow-up Not reported	NA	Mean weeks of cocaine use – Self-report validated by Toxicology – High risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type Follow-up	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
3. (Budney et al., 2011) USA An Initial Trial of a Computerized Behavioral Intervention for Cannabis Use Disorder	*To develop and test a computer-assisted version of MET (motivational enhancement therapy)/CBT (cognitive behavioral therapy)/CM (contingency-management)*	**Population (N=38)** Individuals meeting criteria DSM-IV diagnosis of cannabis abuse Mean age: 33 years **Gender:** 50% male **Ethnicity** 66% White 30% African American Cannabis	**Intervention (N=16)** Computer-delivered MET/CBT/CM **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=22)** Therapist-delivered MET/CBT/CM Evaluation type Non-inferiority	Duration 12 weeks Follow-up Not reported	NA	Mean % days of cannabis use – Self-report – risk of bias not assessed

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type Follow-up	Duration of intervention Follow-up	Outcomes Odds of relapse	Days of use
4. (Budney et al., 2015) USA Computer-Assisted Behavioral Therapy and Contingency Management for Cannabis Use Disorder	*To assess the efficacy of a computer-assisted version of motivational enhancement therapy, cognitive-behavioral therapy, and contingency-management (MET/CBT/CM)*	**Population (N=75)** Adults seeking treatment for cannabis use disorders Mean age: 35 years **Gender:** 57% male **Ethnicity** 59% Black Cannabis	**Intervention (N=30)** Computer-assisted MET/CBT/CM **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=45)** 2 control arms: • Therapist-delivered in-person MET/CBT/CM (N=29) • Brief in-person counselling (N=16) Evaluation type: Non-inferiority	Duration 12 weeks Follow-up At 6 months	Proportion of people relapsed Toxicology Some concerns about risk of bias	Mean % of days cannabis used Self-report and toxicology but unclear which is used – high risk of bias
5. *(Campbell et al., 2014) USA Internet-delivered Treatment for Substance	*to evaluate the effectiveness of the Therapeutic Education System, an internet-delivered behavioral intervention that includes motivational incentives in the*	**Population (N=507)** People entering OP addiction treatment programs	**Intervention (N=255)** TAU + internet-delivered Therapeutic Education System **Type** Self-guided therapy	Control (N=252) TAU	Duration 12 weeks Follow-up Not reported	Proportion of participants relapsed – Self-report and toxicology but unclear	Mean half-weeks of abstinence – Self-report and toxicology but unclear

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Abuse: A Multi-site Randomized Controlled Clinical Trial	*treatment of substance use disorders*	Mean age: 35 years **Gender:** 62% male **Ethnicity** 56% White 44% ethnic/racial minorities Mixed (Illicit drugs or alcohol with illicit drug use)	**Timing** Delivered *parallel* to treatment and/or recovery support	Evaluation type Non-inferiority		which is used – low risk of bias	which is used – low risk of bias
6. *(Carroll et al., 2008) USA Computer-Assisted Delivery of Cognitive-Behavioral Therapy for Addiction: A	*To evaluate the efficacy of a computer-based version of cognitive behavioral therapy (CBT) for substance dependence*	**Population (N=77)** Individuals seeking treatment for substance dependence at OP Mean age: 42 years Gender: 57% male	Intervention (N=39) TAU + CBT4CBT **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=38) TAU Evaluation type Superiority	Duration 8 weeks Follow-up Not reported	NA	Mean % days abstinent of substance use – Self-report confirmed by toxicology

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Randomized Trial of CBT4CBT		**Ethnicity** 46% African American, 34% European American 12% Hispanic 6% Native American Mixed (Any drug and/or alcohol)					– high risk of bias
7. *(Carroll et al., 2014) USA Computer-Assisted Delivery of Cognitive-Behavioral Therapy: Efficacy and durability of CBT4CBT among cocaine-dependent individuals	*To conduct a definitive trial of CBT4CBT in a large, more homogeneous sample*	**Population (N=101)** Adults stabilized on methadone Mean age: 42 years **Gender:** 40% male **Ethnicity** 60% White 30% African American	Intervention (N=47) TAU + CBT4CBT **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=54) TAU Evaluation type Superiority	Duration 8 weeks Follow-up Not reported	% of sample attaining >3 weeks of abstinence – Self-report – some concerns about risk of bias	% drug-free urine samples – Self-report and toxicology – low risk of bias

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
maintained on methadone		Cocaine					
8. (Carroll et al., 2018) USA Galantamine and Computerized Cognitive Behavioral Therapy for Cocaine Dependence: A Randomized Clinical Trial	*To examine whether galantamine is effective at improving cocaine use outcomes and cognitive functioning, alone and in combination with computerized cognitive behavioral therapy*	**Population (N=120)** Individuals stabilized on methadone Mean age: ~38 years **Gender:** 67% male **Ethnicity** 50% White 21% African American 27% Latino Cocaine	**Intervention (N=66)** 2 intervention arms: • Galantamine + CBT4CBT (N=28) • Placebo + CBT4CBT (N=38) **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=54)** 2 control arms: • Galantamine + methadone (N=27) • Placebo + methadone (N=27) Evaluation type Superiority	Duration 12 weeks Follow-up Not reported	NA	Days of cocaine use by month — Self-report and toxicology – some concerns about risk of bias
9. *(Chaple et al., 2016) USA	*To compare the effectiveness of a computerized intervention, the*	**Population (N=494)** Prison inmates with a substance	Intervention (N=249): TES	Control (N=245) TAU	Duration 12 weeks	% of drug use	Mean no. of days abstinent

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
A Comparative Study of the Therapeutic Education System for Incarcerated Substance Abusing Offenders	*Therapeutic Education System (TES), with Standard Care on crime, drug use, and HIV risk behavior post prison release*	use disorder requiring treatment Mean age: 37 years **Gender:** 70% male **Ethnicity** 49% Caucasian 22% African American 13% Hispanics 17% Others Mixed (Any drug and/or alcohol)	**Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Evaluation type Non-inferiority	Follow-up At 3 and 6 months post-prison release	– Self-report – high risk of bias	– Self-report – high risk of bias
10. *(Christensen et al., 2014) USA Adding an Internet-	*To examine the benefit of adding an internet-delivered behavior therapy to a buprenorphine medication program and voucher-based*	**Population (N=170)** Adults meeting the DSM-IV and FDA criteria for buprenorphine treatment	**Intervention (N=92)** internet-based community reinforcement approach intervention + contingency	**Control (N=78)** Contingency management alone (CM-alone) + buprenorphine	Duration 12 weeks Follow-up	NA	Mean no. of total abstinence days – Toxicology

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
delivered Treatment to an Efficacious Treatment Package for Opioid Dependence	*motivational incentives*	Mean age: 34 years **Gender:** 54% male Ethnicity: 95% white Opioids and cocaine	management (CRA+) + buprenorphine **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Evaluation type Superiority	Not reported		– some concerns about risk of bias
11. (DeFulio et al., 2021) USA A smartphone-smartcard platform for contingency management in an inner-city substance use disorder outpatient program	*To evaluate a smartphone-smartcard platform in adults with opioid use disorder who were receiving care in a community outpatient addiction treatment facility*	**Population (N=170)** New and existing patient receiving care in community OP addiction facility Mean age: ~38 years **Gender:** ~50% male **Ethnicity** ~90% White	**Intervention (N=85)** Contingency management (CM) delivered via a Smartphone **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=85) TAU Evaluation type Non-inferiority	Duration 4 months Follow-up Not reported	Mean % of abstinent urine samples – Toxicology – risk of bias not assessed	Not reported

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
		Opioids					
12.*(DeMartini et al., 2018) USA Text Messaging to Reduce Alcohol Relapse in Pre-Listing Liver Transplant Candidates: A Pilot Feasibility Study	*To examine the feasibility of the first mobile, alcohol relapse-prevention intervention for liver transplant patients with alcoholic liver disease (ALD)*	**Population (N=15)** Inpatient (IP) and OP liver transplant candidates with ALD Mean age: 51 years **Gender:** 73% male **Ethnicity** 93% Caucasian Alcohol	**Intervention (N=8)** TAU + text message **Type** Remote recovery support **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=7) TAU Evaluation type Superiority	Duration 8 weeks Follow-up Not reported	% positive urine results showing relapse –Toxicology – some concerns about risk of bias	Not reported
13.*(Fals-Stewart & Lam, 2010) USA Computer-Assisted	*To examine the comparative efficacy of cognitive rehabilitation as an intervention for substance misuse*	**Population (N=160)** People with SUDs admitted to a residential treatment program	**Intervention (N=80)** Standard substance abuse treatment + computer-assisted cognitive rehabilitation (CACR)	**Control (N=80)** Standard substance abuse treatment + computer-assisted typing tutorial (CATT)	Duration 8 weeks Follow-up	Not reported	Mean % days abstinent – Self-report and toxicology but unclear

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Cognitive Rehabilitation for the Treatment of Patients With Substance Use Disorders: A Randomized Clinical Trial		Mean age: 33 years Gender: 58% male **Ethnicity** 29% African American 52% Caucasian 10% Latino Mixed (Any drug and/or alcohol)	**Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Evaluation type Superiority	At 3, 6, 9, and 12 months		which is used – high risk of bias
14.*(Farabee et al., 2013) USA A Comparison of Four Telephone-Based Counseling Styles for Recovering Stimulant Users	*To assess the combined and relative effectiveness of four types of counseling styles, delivered by telephone, relative to a no call control condition*	**Population (N=302)** People completing intensive OP stimulant abuse treatment Mean age: 37 years Gender: 73% male	**Intervention (N=249)** Telephone-based continuing care 4 intervention arms: • Unstructured/non-directive (N=65) • Structured/non-directive (N=61) • Unstructured/directive (N=62) • Structured/directive (N=61)	Control (N=53) TAU	Duration 12 weeks Follow-up At 9 months	% positive urine showing relapse –Toxicology – high risk of bias	Mean no. days stimulant use – Self-report – high risk of bias

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
		Ethnicity 66% White 5% African American 23% Hispanic Drugs (Stimulants)	**Type** Remote talking therapy **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Evaluation type Superiority			
15.*(Farren et al., 2014) Ireland Computerised cognitive behavioural therapy for alcohol use disorder: a pilot randomised control trial	*to examine the effectiveness of an interactive, personalised, computer-based CBT therapy [for people with AUD] in a randomised control trial*	**Population (N=55)** People completed IP detoxification for AUD Mean age: 45 years **Gender:** 72% male **Ethnicity** Not reported	**Intervention (N=31)** Computerised CBT sessions **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=24)** Placebo cognitive-stimulating session Evaluation type Superiority	Duration 4 weeks Follow-up At 3 months	Not reported	Mean no. of drinking days – Self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
		Alcohol					
16.*(Godley et al., 2010) USA A randomized controlled trial of Telephone Continuing Care	*To compare Telephone continuing care (TCC) to usual continuing care (UCC) on substance use*	**Population (N=104)** People in residential substance abuse treatment program Mean age: 32 years Gender: 60% male **Ethnicity** 76% Caucasian 16% African American Mixed (Any drug and/or alcohol)	**Intervention (N=51)** TAU + Telephone Support **Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Control (N=53) TAU Evaluation type Superiority	Duration 12 weeks Follow-up At 3 months	Not reported	Mean % of days abstinent – Self-report confirmed by toxicology – high risk of bias

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
17.*(Gonzales et al., 2014) USA Substance Use Recovery Outcomes among a Cohort of Youth Participating in a Mobile-Based Texting Aftercare Pilot Program	*To examine the feasibility of a 12-week aftercare mobile intervention compared to standard aftercare for substance abuse recovery among youth aged 12 – 24*	**Population (N=81)** Youths completing OP and residential treatment for substance abuse **Mean age:** 20 years (range 14-26 years) Gender: 73% male **Ethnicity** 43% Caucasian 38% Hispanic 10% African American 8% Asian/Pacific Mixed (Any drug and/or alcohol)	**Intervention (N=40)** Project ESQYIR (Educating & Supporting inquisitive Youth in Recovery) Mobile-based aftercare **Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Control (N=41) TAU Evaluation type Non-inferiority	Duration 12 weeks Follow-up At 3 months	No. of participants drug use relapse – Self-report (unclear if validated by toxicology) – high risk of bias	Not reported
18.*(Graser et al., 2021)	*To compare the effectiveness of TEL (telephone) and TEX*	**Population (N=240)** People attending a	**Interventions (N=176)** 3 intervention arms:	Control (N=64) TAU	Duration 6 months	% of people abstinent	Not reported

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Switzerland Telephone- and Text Message– Based Continuing Care After Residential Treatment for Alcohol Use Disorder: A Randomized Clinical Multicenter Study	*(Text) continuing care provided in different frequencies by psychotherapists for patients from residential treatments in mitigating the occurrence of relapse in patients who completed a 12-week abstinence-oriented residential treatment program for AUD*	residential treatment program for AUD Mean age: 50 years **Gender:** 69% male **Ethnicity** Not reported Alcohol	• Tel high-frequency (n=51) • Tel low-frequency (n=64) • Text message (n=61) **Type** Remote talking therapy/remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Evaluation type Superiority	Follow-up Not reported	– Self-report – high risk of bias	
19.*(Gustafson et al., 2014) USA A smartphone application to support recovery from alcoholism:	*To determine whether patients leaving residential treatment for AUDs with a smartphone application to support recovery have fewer risky drinking days*	**Population (N=349)** People who completed residential treatment for AUDs	**Intervention** TAU + ACHESS (Addiction – Comprehensive Health Enhancement Support System) (N=170)	Control (N=179) TAU	Duration 8 months Follow-up At 4 months	% abstinence – Self-report – high risk of bias	Not reported

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
A randomized controlled trial	*than control-group patients*	Mean age: 38 years **Gender:** ~60% male Ethnicity **80% White** 13% African American 7% Other Alcohol	**Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Evaluation type Superiority			
20.(Hubbard et al., 2007) USA Telephone Enhancement of Long-term Engagement (TELE) in Continuing Care for Substance Abuse	*To examine the feasibility and efficacy of phone calls to patients after discharge from inpatient residential substance abuse treatment programs to encourage compliance with continuing care plans*	**Population (N=339)** People discharged from residential and IP substance abuse treatment **Age:** Median 37 years Gender: 64% male	**Intervention (N=169)** The Telephone Enhancement of Long-term Engagement (TELE) intervention – Telephone Call Group (TCG) **Type** Remote talking therapy	Control (N=170) TAU	Duration 12 weeks Follow-up Not reported	No usable data	No usable data

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes Odds of relapse	Days of use
Treatment: A NIDA Clinical Trials Network (CTN) Study		**Ethnicity** 34% African American 3% Hispanic Mixed (Any drug and/or alcohol)	**Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Evaluation type Superiority			
21.*(Johansson et al., 2021) Sweden Internet-based therapy versus face-to-face therapy for alcohol use disorder, a randomized controlled non-inferiority trial	*To compare internet-delivered and face-to-face treatment among adults users with AUD*	**Population (N=301)** People from an OP clinic specializing in treating AUDs Mean age: 50 years **Gender:** 61% male **Ethnicity** Not reported Alcohol	Intervention (N=151) internet-delivered CBT **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=150) In-person CBT Evaluation type Non-inferiority	Duration 12 weeks Follow-up At 3 months	Not reported	Mean no. of non-drinking days – Self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
22.(Keoleian et al., 2013) USA A Cognitive Behavioral Therapy-Based Text Messaging Intervention for Methamphetami ne Dependence	*To develop and test a novel text messaging intervention for use as an adjunct to cognitive behavioral group therapy*	**Population (N=5)** People seeking treatment in an OP addiction treatment facility for methamphetamin e use Mean age: 29 years **Gender:** 80% male **Ethnicity** 60% Caucasian Methamphetamin e	**Intervention (N=2)** CBT-based text messaging intervention **Type** Remote recovery support **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=3) Placebo message Evaluation type Superiority	Duration 3 weeks Follow-up Not reported	No usable data	No usable data
23.*(Kiluk et al., 2016) USA Randomized Trial of Computerized	*To evaluate the feasibility, safety, preliminary efficacy, and marginal costs of CBT4CBT and standard treatment at*	Population (N=68) People receiving outpatient substance abuse treatment	**Intervention (N=46)** 2 intervention arms: • TAU + CBT4CBT (N=22) • CBT4CBT + monitoring (N=24)	Control (N=22) TAU	Duration 8 weeks Follow-up	Not reported	Mean % days abstinent – Self-report confirmed

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Cognitive Behavioral Therapy for Alcohol Use Disorders: Efficacy as a Virtual Stand-Alone and Treatment Add-On Compared with Standard Outpatient Treatment	*reducing rates of alcohol use*	Mean age: 43 yrs **Gender:** 65% male Ethnicity: 34% Caucasian 54% African American 7% Hispanics	**Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Evaluation type Superiority	At 1, 3 and 6 months		by toxicology – some concerns about risk of bias
24.*(Kiluk et al., 2018) USA Randomized Clinical Trial of Computerized and Clinician-Delivered CBT in Comparison With Standard	*To evaluate the efficacy and safety of CBT4CBT as a virtual stand-alone treatment, delivered with minimal clinical monitoring, and clinician-delivered (CBT) compared with treatment as usual in treatment-seeking outpatients with*	**Population (N=137)** individuals seeking substance abuse treatment Mean age: 36 years **Gender:** 75% male	**Intervention (N=38)** CBT4CBT + monitoring **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment	**Control (N=99)** 2 control arms: • Clinician-delivered CBT (N=49) · TAU (N=50) Evaluation type Non-inferiority	Duration 12 weeks Follow-up At 3 months	No drug-positive urine specimens –Toxicology – high risk of bias	% days abstinent from drugs and alcohol – self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Outpatient Treatment for Substance Use Disorders: Primary Within-Treatment and Follow-Up Outcomes	*substance use disorders*	**Ethnicity** 49% African American 34% Caucasian 8% Latino Mixed (Cocaine, marijuana, opioid, or alcohol)	and/or recovery support				
25.(King et al., 2009) USA Assessing the effectiveness of an Internet-based videoconferencing platform for delivering intensified substance abuse counseling	*To assess treatment satisfaction and response to Internet-based (CRC Health Group's e-Getgoing) group counseling for partial responders to methadone maintenance treatment*	**Population (N=37)** Poor responders to methadone maintenance treatment Mean age: 41 years **Gender:** 38% male **Ethnicity** 44% minority Opioids	**Intervention (N=20)** Internet-based group counseling (e-Getgoing) **Type** Remote talking therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=17) TAU Evaluation type Non-inferiority	Duration 6 weeks Follow-up Not reported	% of drug-positive urine samples urine – Toxicology – high risk of bias	Not reported

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
26.(King et al., 2014) USA A randomized trial of web-based videoconferencing for substance abuse counseling	*To evaluate the feasibility and acceptability of web-based videoconferencing in community opioid treatment program (OTP) participants*	**Population (N=85)** OP receiving opioid dependence treatment Mean age: 41 years **Gender:** 44% male **Ethnicity** 36% minority Opioids	**Intervention (N=50)** Web-based individual counseling delivery using video-conferencing platform (eGetgoing) **Type** Remote talking therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=35) TAU Evaluation type Non-inferiority	Duration 12 weeks Follow-up Not reported	Not reported	Mean % of any drug-positive urine specimens –Toxicology – high risk of bias
27.(Lucht et al., 2014) Germany A Surveillance Tool Using Mobile Phone Short Message Service to	*To test the superiority of an interactive SMS intervention + TAU over TAU in reducing alcohol consumption*	**Population (N=80)** People in residential IP unit for treatment of dependence disorders	**Intervention (N=42)** TAU + SMS (Short Message Service) **Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive	Control (N=38) TAU Evaluation type Superiority	Duration 8 weeks Follow-up Not reported	Not reported	Mean drinking days within 30 days – Self-report – risk of bias not assessed

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Reduce Alcohol Consumption Among Alcohol-Dependent Patients		Mean age: 46 years **Gender:** 80% male **Ethnicity** Not reported Alcohol	treatment or recovery support phase				
28.*(Lucht et al., 2021) Germany Effect of a 1-year short message service in detoxified alcohol-dependent patients: a multi-center, open-label randomized controlled trial	*To assess if the use of an interactive mobile phone helpline system (SMS) added to treatment as usual (TAU) would reduce the proportion of patients who report heavy drinking during 1 year after discharge from inpatient detoxification compared with TAU alone*	**Population (N=463)** People receiving ongoing inpatient alcohol detoxification Mean age: 45 years **Gender:** 77% male **Ethnicity** Not reported Alcohol	Intervention (N=230) TAU + SMS **Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Control (N=233) TAU Evaluation type Superiority	Duration 12 months Follow-up Not reported	No. of people abstinent – Self-report – some concerns about risk of bias	Mean no. of reported abstinence days – Self-report – some concerns about risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
29.(Marsch et al., 2014) USA Web-based Behavioral Treatment for Substance Use Disorders as a Partial Replacement of Standard Methadone Maintenance Treatment	*To evaluate the effectiveness of a web-based behavioral intervention when deployed in a model where it partially substituted for standard counseling in a community-based specialty addiction treatment program*	**Population (N=160)** People entering methadone maintenance treatment Mean age: 41 years **Gender:** 75% male **Ethnicity** 44% White 32% Black 24% Other Opioids	**Intervention (N=80)** Reduced standard treatment + the web-based Therapeutic Education System (Reduced Standard + TES) **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=80) TAU Evaluation type Non-inferiority	Duration 12 months Follow-up Not reported	Not reported	Mean % weeks of abstinence –Toxicology – high risk of bias
30.*(McKay et al., 2004) USA The effectiveness of telephone-based	*To compare the effectiveness of a 3-month telephone-based continuing care intervention relative to two other active interventions—*	**Population (N=359)** People who received intensive outpatient treatment for	**Intervention (N=102)** Telephone-based monitoring and brief counseling	**Controls (N=257)** 2 control arms: • TAU (N=122) • Individualised relapse	Duration 12 weeks Follow-up	% participant s total abstinent	Mean % days of abstinence – Self-report validated by toxicology

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
continuing care in the clinical management of alcohol and cocaine use disorders: 12-month outcomes	*cognitive-behavioral relapse prevention and group counseling with a 12-step focus*	cocaine/alcohol dependence Mean age: 42 years **Gender:** 83% male **Ethnicity:** 77% African American Mixed (Cocaine and Alcohol)	**Type** Remote talking therapy **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	prevention (CBT)(N=135) Evaluation type Non-inferiority	At 3, 6 and 9 months	– Self-report (TLFB) – high risk of bias	– high risk of bias
31.*(McKay et al., 2010) USA A Randomized Trial of Extended Telephone-Based Continuing Care for Alcohol Dependence: Within Treatment	*To test whether telephone continuing care, either as monitoring and feedback (TM) or longer contacts that included counseling (TMC), to intensive outpatient programs (IOP) improved outcomes for alcohol dependent patients*	**Population (N=252)** People completing an Intensive Outpatient Treatment for alcohol dependence Mean age: 43 years	**Intervention (N=166)** 2 intervention arms: • TAU + telephone monitoring (N=83) • TAU + telephone monitoring + counselling (N=83) **Type** Remote talking therapy **Timing** Delivered when *transitioning* to	Control (N=86) TAU Evaluation type Superiority	Duration 18 months Follow-up Not reported	% reporting any alcohol use – Self-report (TLFB) – some concerns about risk of bias	% days of alcohol use – Self-report (TLFB) – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Substance Use Outcomes		**Gender:** 64% male **Ethnicity** 88.9% African American Alcohol	a less intensive treatment or recovery support phase				
32.*(McKay et al., 2013) USA An Adaptive Approach for Identifying Cocaine Dependent Patients Who Benefit from Extended Continuing Care	*To evaluate an adaptive treatment model for cocaine dependence to identify patients who most benefited from extended continuing care*	**Population (N=321)** People completing an intensive OP programs for alcohol and cocaine dependence Mean age: 43 years Gender: 76% male **Ethnicity** 89% African American	**Intervention (N=213)** 2 intervention arms: • TAU + Telephone monitoring + counseling (TMC) (N=106) • TAU + Telephone monitoring + counseling + incentives (TMC+) (N=107) **Type** Remote talking therapy **Timing** Delivered when *transitioning* to a less intensive	Control (N=108) TAU Evaluation type Superiority	Duration up to 24 months Follow-up Not reported	% abstinence – Self- report confirmed by toxicology – high risk of bias	Not reported

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
		Mixed (Any drug and/or alcohol)	treatment or recovery support phase				
33.(McKellar et al., 2012) USA One-year outcomes of telephone case monitoring for patients with substance use disorder	*To investigate whether in-person continuing care as usual (CCAU) following intensive outpatient SUD treatment leads to better SUD outcomes when compared with telephone case monitoring (TCM)*	**Population (N=667)** Veterans receiving intensive outpatient substance use disorder treatment Mean age: 51 years **Gender:** 95% male **Ethnicity** 50% Caucasian 44% African American 6% Other Mixed (Any drug and/or alcohol)	**Intervention (N=213)** Telephone case monitoring as aftercare **Type** Remote talking therapy **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Control (N=454) TAU Evaluation type Non-inferiority	Duration 6 months Follow-up At 6 months	Not reported	% days in mean difference abstinent from alcohol – Self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
34.(Moore et al., 2013) USA The Recovery Line: A pilot trial of automated, telephone-based treatment for continued drug use in methadone maintenance	*To evaluate feasibility, acceptability, and initial efficacy of a therapeutic Interactive Voice Response (IVR) system ("The Recovery Line") for opioid dependent patients receiving methadone maintenance*	**Population (N=36)** People enrolled in methadone maintenance treatment Mean age: 41 years **Gender:** 42% male **Ethnicity** 58% White 28% Black 14% Other Opioids and cocaine	**Intervention (N=18)** TAU + Recovery Line **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=18) TAU Evaluation type Superiority	Duration 4 weeks Follow-up Not reported	Mean proportion of urine screens negative for opioids –Toxicology – some concerns about risk of bias	Not reported
35.(Moore et al., 2019) USA A randomized clinical trial of	*To assess the clinical efficacy of the improved Recovery Line among methadone maintained patients*	**Population (N=82)** People currently receiving methadone treatment	**Intervention (N=40)** TAU + Recovery Line **Type** Self-guided therapy	Control (N=42) TAU Evaluation type Superiority	Duration 12 weeks Follow-up	Not reported	Mean % of urine screens negative for illicit drugs

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
the Recovery Line among methadone treatment patients with ongoing illicit drug use	*with continued drug use*	Mean age: ~42 years **Gender:** 60% male **Ethnicity** 20% Black 69% White Opioids	**Timing** Delivered *parallel* to treatment and/or recovery support		Not reported		–Toxicology – some concerns about risk of bias
36.*(Mundt et al., 2006) USA An interactive voice response program to reduce drinking relapse: A feasibility study	*To explore the feasibility of incorporating daily IVR (interactive voice response) monitoring of drinking behaviors to improve treatment outcome*	**Population (N=60)** People who had completed a residential alcohol treatment program Mean age: 42 years **Gender:** 55% male **Ethnicity** 95% Caucasian	**Intervention (N=40)** 2 intervention arms: • Daily IVR reporting with follow-up (N=20) • Daily IVR reporting without follow-up (N=20) **Type** Self-guided therapy **Timing** Delivered when *transitioning* to a less intensive	Control (N=20) TAU Evaluation type	Duration 6 months Follow-up Not reported	% abstinence – Self-report (unclear if validated by toxicology) – high risk of bias	Not reported

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
		5% African American Alcohol	treatment or recovery support phase	Superiority			
37.(Nahum-Shani et al., 2017) USA A SMART data analysis method for constructing adaptive treatment strategies for substance use disorders	*To demonstrate how Q-learning, can be used with data from a sequential, multiple assignment, randomized trial (SMART) to construct empirically an adaptive treatment strategy (ATS)*	Population (N=250) Mean age: 49 years **Gender:** 87% male **Ethnicity** 72% White 27% Black 4% Latino Alcohol	**Intervention (N=not reported)** Telephone Disease Monitoring (TDM) + naltrexone (NTX) **Type** Remote recovery support **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=not reported) TAU Evaluation type Superiority	Duration 6 months Follow-up Not reported	Not reported	Mean % of abstinence days – Self-report – risk of bias not assessed
38.(Nichols, 2015) USA Treatment readiness and outcomes in	*To determine if adults with alcohol problems participating in blended continuing care versus continuing care as usual reveal any difference in their*	**Population (N=78)** People completing alcohol residential treatment	**Intervention (N=38)** Blended online and in-person continuing care: Assessable Care and Effective Support Services (AC/ESS)	Control (N=40) TAU Evaluation type	Duration 12 weeks Follow-up	Not reported	Mean no. of sober days – Self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
clients with alcohol problems: comparing blended versus continuing care as usual	*motivation and readiness to change*	Mean age: 40 years **Gender:** 57% male **Ethnicity** All white Caucasians Alcohol	**Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Non-inferiority	Not reported		
39.*(Paris et al., 2018) USA Culturally Adapted, Web-Based Cognitive Behavioral Therapy for Spanish-Speaking Individuals With Substance Use Disorders: A	*To evaluate whether adding Web-based cognitive behavioral treatment (CBT) to standard outpatient psychiatric or addiction treatment improved substance use outcomes*	**Population (N=92)** Spanish speaking individuals seeking treatment at outpatient addiction services Mean age: 43 years **Gender:** 67% male **Ethnicity** All Latino	Intervention (N=43) TAU + CBT4CBT **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=49) TAU Evaluation type Superiority	Duration 8 weeks Follow-up At 1, 3, and 6 months	Not reported	Mean % of negative urine for all drugs –Toxicology – some concerns about risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
Randomized Clinical Trial		Mixed (Any drug and/or alcohol)					
40.(Scott et al., 2020) USA A randomized clinical trial of smartphone self-managed recovery support Services	*To assess the effectiveness of smartphone-based ecological momentary interventions (EMI) and assessments (EMA), delivered separately and combined, to provide recovery support following substance use disorder (SUD) treatment engagement*	**Population (N=401)** People engaged in outpatient or residential treatment for SUD Mean age: 44 years Gender: 61% male **Ethnicity** 70% African American 20% Caucasian 6% Hispanic Mixed (Any drug and/or alcohol)	**Intervention (N=303)** 3 intervention arms: • TAU + Ecological Momentary Interventions (EMIs)(N=100) • TAU + Ecological Momentary Assessments (EMAs)(N=98) • TAU + EMIs + EMAs combined (N=105) **Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Control (N=98) TAU Evaluation type Superiority	Duration 6 months Follow-up Not reported	Not reported	No. of abstinent days [in Z scores]) – Self-report confirmed by toxicology – high risk of bias

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
41.(Shi et al., 2019) USA Randomized pilot trial of Web-based cognitive-behavioral therapy adapted for use in office-based buprenorphine maintenance	*To describe the adaptation of Web-based cognitive-behavioral therapy (CBT4CBT) for use in office-based buprenorphine treatment as well as a randomized pilot study evaluating its feasibility and efficacy compared with standard buprenorphine care*	**Population (N=20)** Opioid-dependent individuals seeking treatment at a MAT (medication-assisted therapy) provider Mean age: 41 years **Gender:** 60% male **Ethnicity** 100% White Opioids	Intervention (N=10) TAU + CBT4CBT **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=10) TAU Evaluation type Superiority	Duration 12 weeks Follow-up Not reported	No usable data	No usable data
42.(Stoner et al., 2015) USA Randomized controlled trial of	*to evaluate the feasibility and efficacy of AGATE-Rx (Adaptive, Goal-directed Adherence Tracking and Enhancement,*	**Population (N=76)** Individuals receiving naltrexone treatment	**Intervention (N=37)** AGATE-Rx (Medication reminder via SMS messages)	**Control (N=39)** SMS message prompt on Alcohol and Side Effects Diary (SASED), no	Duration 8 weeks Follow-up	No usable data	No usable data

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Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
a mobile phone intervention for improving adherence to naltrexone for alcohol use disorders	*with addition of adaptive mobile medication reminders and adherence assessments) for improving naltrexone adherence*	Mean age: 38 years **Gender:** 66% male **Ethnicity** 36% White 48% Hispanic Alcohol	**Type** Remote recovery support **Timing** Delivered *parallel* to treatment and/or recovery support	medication reminder Evaluation type Superiority	Not reported		
43.* (Tetrault et al., 2020) USA Computerized Cognitive Behavioral Therapy for Substance Use Disorders in a Specialized Primary Care Practice: A Randomized Feasibility Trial to	*To evaluate feasibility, satisfaction, and substance use outcomes of standard care plus access to a web-based intervention (CBT4CBT) for patients with substance use disorder (SUD)*	**Population (N=58)** People engaging in care at the Addiction Recovery Clinic Mean age: 44 years **Gender:** 57% male **Ethnicity** 60% White	Intervention (N=30) TAU + CBT4CBT **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	Control (N=28) TAU Evaluation type Superiority	Duration 8 weeks Follow-up Not reported	Not reported	Mean % days abstinent all drugs – Self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type Follow-up	Duration of intervention Follow-up	Outcomes Odds of relapse	Days of use
Address the RT Component of SBIRT		29% Black 9% Latino Mixed (Any drug and/or alcohol)					
44.*(Tiburcio et al., 2018) Mexico Web-Based Intervention to Reduce Substance Abuse and Depression: A Three Arm Randomized Trial in Mexico	*To evaluate the feasibility and initial effectiveness of a web-based cognitive-behavioral intervention for the reduction of substance use and depression compared with treatment as usual, with and without a printed self-help manual*	**Population (N=74)** Individuals seeking treatment for substance abuse **Mean age:** Range 17 to >26 years **Gender:** 88% male Ethnicity Not reported Drugs (Marijuana, inhalants, cocaine)	**Intervention (N=23)** Web-based Help Program for Drug Abuse and Depression (Programa de Ayuda para Abuso de Drogas y Depresión [PAADD]) **Type** Self-guided therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=51)** 2 control arms: • ASSIST self-help guide + TAU (ASSIST-SHG+TAU) (N=25) • TAU (N=26) Evaluation type Non-inferiority	Duration 8 weeks Follow-up At 4 weeks	Not reported	Mean no. of days of substance use – Self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
45.*(Timko et al., 2019a) USA Randomized controlled trial of enhanced telephone monitoring with detoxification patients: 3- and 6-month outcomes	*To compare Enhanced Telephone Monitoring (ETM) to usual care (UC) on the primary outcome of reducing subsequent detoxification*	**Population (N=298)** Psychiatry inpatients undergoing detoxification for alcohol and/or opioid dependence Mean age: 50 years Gender: 95% male **Ethnicity** 76% White Mixed (Opioids and/or alcohol)	**Intervention (N=148)** TAU + Enhanced Telephone Monitoring (ETM) **Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Control (N=150) TAU Evaluation type Superiority	Duration 12 weeks Follow-up At 3 months	Not reported	Mean no. of days of alcohol use – Self-report – high risk of bias
46.*(Timko et al., 2019b) USA	*To examine the effectiveness of telephone monitoring among psychiatry inpatients with co-*	**Population (N=406)** Psychiatry inpatients with	**Intervention (N=207)** TAU + telephone monitoring	Control (N=199) TAU	Duration 12 weeks	Not reported	Mean no. of drinking days – Self-report

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type Follow-up	Duration of intervention	Outcomes	
						Odds of relapse	Days of use
Randomized Controlled Trial of Telephone Monitoring with Psychiatry Inpatients with Co-Occurring Substance Use and Mental Health Disorders	*occurring substance use and mental health disorders*	substance use disorders Mean age: 45 years Gender: 92% male Ethnicity: 63% White Mixed (Any drug and/or alcohol)	**Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	Evaluation type Superiority	Follow-up At 6 and 12 months		– high risk of bias
47.*(Verduin et al., 2013) USA Computer simulation games as an adjunct for treatment in male veterans with alcohol use disorder	*To examine the efficacy of a novel game simulation (Guardian Angel) for relapse prevention called as an adjunct to UC*	**Population (N=41)** Veterans enrolled in an intensive outpatient substance abuse treatment program Mean age: 51 years **Gender:** Males only	**Intervention (N=22)** Computer game simulation (Guardian Angel) for alcohol relapse prevention **Type** Computer simulation game **Timing** Delivered *parallel* to treatment	**Control (N=19)** Educational slide show Evaluation type Superiority	Duration 12 weeks Follow-up At 4 weeks	% relapse – Self-report + toxicology – high risk of bias	Not reported

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
		Ethnicity 66% African American 31% Caucasian 2% Hispanic Alcohol	and/or recovery support				
48.(Wenze et al., 2015) USA Adjunctive Psychosocial Intervention Following Hospital Discharge for Patients with Bipolar Disorder and Comorbid Substance Use: A Pilot Randomized Controlled Trial	*To compare the Integrated Treatment Adherence Program, which includes individual and telephone sessions provided to patients and their significant others, versus Enhanced Assessment and Monitoring for those with BD-SUD*	**Population (N=30)** Psychiatry inpatients with drug and alcohol use disorders Mean age: 47 years Gender: 50% male **Ethnicity** 90% Caucasians Mixed (Any drug and/or alcohol)	**Intervention (N=14)** Integrated Treatment Adherence Program (both in-person and telephone-delivered sessions) **Type** Remote recovery support **Timing** Delivered when *transitioning* to a less intensive treatment or recovery support phase	**Control (N=16)** TAU with enhanced assessment and monitoring Evaluation type Non-inferiority	Duration 6 months Follow-up Not reported	Not reported	No. of drinking days [Regression data]) – Self-report – high risk of bias

Author / year Country Title	Aims	Participant characteristics Substance use	Intervention characteristics: Sample/type/timing	Comparison characteristics/ evaluation type	Duration of intervention Follow-up	Outcomes	
						Odds of relapse	Days of use
49.*(Wolitzky-Taylor et al., 2018) USA Randomized Clinical Trial Evaluating the Preliminary Effectiveness of an Integrated Anxiety Disorder Treatment in Substance Use Disorder Specialty Clinics	*To evaluate the preliminary effectiveness of CALM ARC (The Coordinated Anxiety Learning and Management for Addiction Recovery Centers) in reducing anxiety and substance use symptoms compared with the Substance use disorder intensive outpatient treatment alone*	**Population (N=97)** Individuals with anxiety disorders seeking treatment for substance use disorders Mean age: 36 years **Gender:** 57% male **Ethnicity** 72% White 11% Latino 11% Asian American Mixed (Any drug and/or alcohol)	Intervention (N=56) TAU + CALM ARC **Type** Remote talking therapy **Timing** Delivered *parallel* to treatment and/or recovery support	**Control (N=41)** TAU + weekly assessments Evaluation type Non-inferiority	Duration 7 weeks Follow-up ? At 6 months	Not reported	Mean no. of drinking days – Self-report – high risk of bias

* Studies included in meta-analysis (n=29)

**TAU = treatment as usual. Note that this varied, sometimes considerably, between studies.

APPENDIX 2: EXAMPLE SEARCH STRATEGIES

1) Database map update search

Re-run as below up until end of June 2021 and de-duplicated against original map's search results

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily >

Terms for substance use or heavy drinking

1   (Substance adj2 ("use" or user* or usage or misuse or abuse* or misuse or depend* or addict* or disorder*)).ti,ab,kw. (55038)

2   ((solvent* or drug or drugs) adj3 (addict* or abus* or misuse* or user or users or disorder* or dependen* or recovery or intoxicat* or withdraw* or detox* or habit* or recreation* or illicit or relapse)).ti,ab,kw. (96747)

3   ((cocaine or marijuana* or cannab* or hashish or opium or opioid* or opiate* or heroin or amphetamine* or methamphetamine* or Ketamine or ecstasy or MDMA or "recreational drugs" or "illicit drugs" or "illicit substances" or "street drug" or "street drugs" or "poly-drug" or polydrug or morphine or meth or methadone or methoxetamine) adj2 (addict* or abus* or misuse* or user or users or disorder* or dependen* or recovery or intoxicat* or withdraw* or detox* or habit* or "use" or abstain* or abstinence or relapse or craving)).ti,ab,kw. (64785)

4   ("club drug" or "club drugs" or "Drug using population" or "Drug using populations" or "who inject drugs" or "who use drugs").ti,ab,kw. (3181)

5   "Drug problems".ti,ab,kw. (1007)

6   "drug use".ti,ab,kw. (41260)

7   "drug treatment".ti,ab,kw. (28976)

8   "drug prevention".ti,ab,kw. (662)

9   Street drugs/ or crack cocaine/ or designer drugs/ or substance-related disorders/ or Amphetamine-Related Disorders/ or cocaine-related disorders/ or inhalant abuse/ or marijuana abuse/ or opioid-related disorders/ or heroin dependence/ or morphine dependence/ or opium dependence/ or substance abuse, intravenous/ or phencyclidine abuse/ or substance abuse, oral/ or exp substance withdrawal syndrome/ or drug users/ (157963)

10   exp Alcohol-related disorders/ or alcoholism/ or alcoholics/ or binge drinking/ or alcohol abstinence/ or alcohol intoxication/ or exp Alcohol-Induced Disorders/ or Wernicke Encephalopathy/ or Alcohol Withdrawal Delirium/ or Alcohol Withdrawal Seizures/ or Psychoses, Substance-Induced/ (114328)

11   alcohol drinking/th (625)

12   (Alcoholic* or alcoholism).ti,ab,kw. (81070)

13   (alcohol* adj3 (abus* or misuse* or disorder* or problem* or dependen* or treatment* or recovery or quit* or anonymous or harmful* or hazardous or intoxicat* or risky* or withdraw* or detox* or heavy or heavily or excess* or therap* or habit* or addict* or unhealthy or abstinence)).ti,ab,kw. (79554)

14   (((Drinker* or drinking) adj2 (binge or risky or excess* or harmful* or hazardous* or heavy or heavily or unhealthy)) or (Alcohol and (drink* adj2 problem*))).ti,ab,kw. (17831)

15   ((("at risk" or relapse* or risky) adj2 drink*) or (risk adj2 drinker*)).ti,ab,kw. (1990)

16   (((risky or unhealthy or harmful or excess* or heavy or hazardous) adj1 consumption) and alcohol).ti,ab,kw. (757)

17   1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 (446540)

Controlled terms for technology and either the intervention/ action of the technology/ evaluation

18   Computer Terminals/ or Microcomputers/ or minicomputers/ or Computers, Handheld/ or Smartphone/ or Telemedicine/ or Telerehabilitation/ or Mobile applications/ or Text messaging/ or Cell phone/ or Therapy, computer assisted/ or Information technology/ or Internet/ or speech recognition software/ or Computer simulation/ or virtual reality/ or User-computer interface/ or Social networking/ or online social networking/ or "cell phone use"/ or Technology transfer/ or internet access/ or Virtual reality exposure therapy/ or automation/ or social media/ or computer communication networks/ or Wireless technology/ or telecommunications/ or Telemetry/ or Remote Sensing Technology/ or Wearable electronic devices/ or medical informatics applications/ (365477)

19   (therapy or "prevention and control" or rehabilitation).fs. (1926923)

20   User-computer interface/ or treatment outcome/ or Telemedicine/ or Telerehabilitation/ or Precision medicine/ or patient care/ or rehabilitation/ or self care/ or Therapy, computer assisted/ or Secondary prevention/ or Primary prevention/ or Tertiary prevention/ or Self help groups/ or Feedback, Psychological/ or Feedback, Sensory/ or Biofeedback, Psychology/ or Behavior Therapy/ or Neurofeedback/ or Mind-Body Therapies/ or Psychotherapy/ or Psychosocial Support Systems/ or Social Support/ or "Treatment Adherence and Compliance"/ or "Ecological Momentary Assessment"/ or Behavior control/ or risk reduction behavior/ or evaluation studies as topic/ or pilot projects/ or feasiblity studies/ or program evaluation/ or benchmarking/ or Health Behavior/ or health risk behaviors/ or Feedback/ or Harm reduction/ or Patient Education as Topic/ (1579909)

21   19 or 20 (3120814)

22   18 and 21 (91301)

Free text terms for technology and intervention

23   ((intervention* or program* or service*) and (mobile or web* or computer* or digital* or wireless* or Bluetooth or cyber* or online* or virtual* or intelligen* or software or Cellular phone* or cell phone* or electronic* or smartphone* or "smart phone" or "smart phones" or automated or electronic* or (portable adj2 media) or Internet* or Technolog* or Automation or microcomp* or ipad or iphone or ipod or netbook or "touch screen" or hardware or software or "multimedia device" or "multi media device" or "portable device*" or ("hand held" adj2 device*) or (handheld adj2 device*) or texting* or "text messag*" or SMS or ("short messag*" adj1 service*) or (text adj3 deliver*) or "social networking" or "social media" or Messenger* or Facebook or Whatsapp)).ti. (17405)

24   ((intervention* or program* or service*) adj5 (mobile or web* or computer* or digital* or wireless* or Bluetooth or cyber* or online* or virtual* or intelligent* or Cellular phone* or cell phone* or electronic* or smartphone* or "smart phone" or "smart phones" or automated or (artificial adj2 intelligen*) or (portable adj2 media) or Internet* or Technolog* or Automation or microcomp* or ipad or iphone or ipod or netbook or "touch screen" or hardware or software or "multimedia device" or "multi media device" or "portable device*" or ("hand held" adj2 device*) or (handheld adj2 device*) or texting* or "text messag*" or SMS or ("short messag*" adj1 service*) or (text adj3 deliver*) or "social networking" or "social media" or Messenger* or Facebook or Whatsapp)).ab. (59987)

25   ("mhealth" or "mobile health" or "m health" or "e health" or ehealth or ("electronic health" not "electronic health record*")).ti,ab. (7925)

26   (telehealth* or telemedicine or teletherap* or "tele health*" or "tele medicine" or "tele therap*" or telemonitor* or "tele monitor*").ti,ab. (14322)

27   (smartwatch* or "smart watch" or "smart watches" or "smart shoe*" or "smart book*" or "assistive technolog*" or (digital* adj2 phenoty*) or "Augmented Reality" or "Virtual Reality").ti,ab. (11053)

28   ((smart* or wearable) adj3 (device or technolog* or sensor* or track*)).ti,ab. (5849)

29   (voice adj2 (response or recog* or automat* or intelligent* or electronic* or Internet or computer* or digital*)).ti,ab. (1702)

30   (mobile-sensing or "mobile sensing" or msens* or geosens* or geolocat* or geofenc* or "geo sens*" or "geo-sens*" or "geo fenc*" or "geo-fenc*" or "geo locat*" or "geo-locat*" or Ecounsel* or eCBT or "e CBT" or etherapy or "e therapy" or "eSBI" or "e SBI" or chatroom* or "chat room*" or (text adj3 chat*) or chatbot* or "live chat*" or "chat bot" or "chat bots" or "chat interface*" or "chat forum*" or "chat site" or "chat sites" or chatsite* or chatbox* or "chat box*" or breathal*).ti,ab. (1776)

31   (app or apps or "app-based").ti. (5387)

32   (((smartphone* or "smart phone" or "smart phones") adj3 apps) or (mobile* adj3 apps) or (digital* adj3 apps) or (electronic* adj3 apps) or (web* adj3 apps) or (internet* adj3 apps) or (computer* adj3 apps)).ab. (1705)

33   (((smartphone* or "smart phone" or "smart phones") adj3 app) or (mobile* adj3 app) or (digital* adj3 app) or (electronic* adj3 app) or (web* adj3 app) or (internet* adj3 app) or (computer* adj3 app)).ab. (2019)

34   (((smartphone* or "smart phone" or "smart phones") adj3 application*) or (mobile* adj3 application*) or (digital* adj3 application*) or (electronic* adj3 application*) or (web* adj3 application*) or (internet* adj3 application*) or (computer* adj3 application*)).ti,ab. (16739)

Free text terms for technology and the action of the technology

35   (((Device* or platform* or interface* or deliver* or assist* or facilitat* or guid* or aid* or generat* or application*) adj3 (portable or mobile* or web* or computer* or digital* or wireless or Bluetooth or cyber* or online or virtual* or intelligen* or software or Cellular phone* or cell phone* or electronic* or automated or smartphone* or "smart phone" or "smart phones" or electronic* or "multi media" or multimedia or handheld or "hand held" or Internet* or Technolog* or Automation or microcomp* or ipad* or iphone* or ipod* or netbook* or "touch screen" or hardware

or software)) and ((behav* adj2 chang*) or support* or treatment* or feedback or monitor* or chat* or interact* or advice or advis* or tailor* or personalis* or counsel* or therap* or "self help" or "self-help" or "self care" or "self-care" or "self-guide*" or "self guide*" or communicat* or messag* or biofeedback or rehab* or "momentary assessment*" or "momentary intervention*" or "mutual help" or prevent* or forum or discuss* or comment* or post* or share or sharing or network*)).ti,ab. (102831)

36   (((behav* adj2 chang*) or support* or treatment* or feedback or monitor* or chat* or interact* or advice or advis* or tailor* or personalis* or counsel* or therap* or "self help" or "self-help" or "self care" or "self-care" or "self-guide*" or "self guide*" or communicat* or messag* or biofeedback or rehab* or "momentary assessment" or "momentary intervention*" or "mutual help" or prevent*) adj5 (portable or mobile* or web* or computer* or digital* or wireless or Bluetooth or cyber* or online or virtual* or intelligen* or software or cellular phone* or cell phone* or electronic* or automated or smartphone* or "smart phone" or "smart phones" or electronic* or "multi media" or multimedia or handheld or "hand held" or Internet* or technolog* or automation or microcomp* or ipad* or iphone* or ipod* or netbook* or "touch screen" or hardware or software)).ti,ab. (123610)

37   ((forum or discuss* or comment* or post* or share or sharing or network*) adj5 (portable or mobile* or web* or computer* or digital* or wireless or Bluetooth or cyber* or online or virtual* or intelligen* or software or cellular phone* or cell phone* or electronic* or automated or smartphone* or "smart phone" or "smart phones" or electronic* or "multi media" or multimedia or handheld or "hand held" or Internet* or technolog* or automation or microcomp* or ipad* or iphone* or ipod* or netbook* or "touch screen" or hardware or software)).ti,ab. (44293)

38   (assessment adj5 (web* or computer* or online or virtual* or electronic* or automated or Internet* or text*)).ti,ab. (8932)

39   ((texting* or "text messag*" or SMS or ("short messag*" adj1 service*) or (text adj3 deliver*) or "social networking" or "social media" or Messenger* or Facebook or Whatsapp) adj5 ((behav* adj2 chang*) or support* or treatment* or feedback or monitor* or chat* or interact* or advice or advis* or tailor* or personalis* or counsel* or therap* or "self help" or "self-help" or "self care" or "self-care" or "self-guide*" or "self guide*" or biofeedback or rehab* or "momentary assessment" or "momentary intervention*" or "mutual help" or prevent*)).ti,ab. (4020)

Specific title only terms for technology and the outcome on behavior, where not covered by above.

40   ((portable or mobile or web* or computer* or digital* or wireless or Bluetooth or cyber* or online or virtual* or intelligen* or software or Cellular phone* or cell phone* or electronic* or automated or smartphone* or "smart phone" or "smart phones" or electronic* or "multi media" or multimedia or handheld or "hand held" or Internet* or Technolog* or Automation or microcomp* or ipad or iphone or ipod or netbook or "touch screen" or hardware or software or texting* or "text messag*" or SMS or ("short messag*" adj1 service*) or (text adj3 deliver*) or "social networking" or "social media" or Messenger* or Facebook or Whatsapp) and (recovery or relapse or withdraw* or abstinence)).ti. (998)

41   ((portable or mobile or web* or computer* or digital* or wireless or Bluetooth or cyber* or online or virtual* or intelligen* or software or Cellular phone* or cell phone* or electronic* or automated or smartphone* or "smart phone" or "smart phones" or electronic* or "multi media" or multimedia or handheld or "hand held" or Internet* or Technolog* or Automation or microcomp* or ipad or iphone or ipod or netbook or "touch screen" or hardware or software or texting* or "text messag*" or SMS or ("short messag*" adj1 service*) or (text adj3 deliver*) or "social networking" or "social media" or Messenger* or Facebook or Whatsapp) and ((reduc* or increase* or frequency or prevent* or curb*) adj3 (intake or consumption or alcohol or drink* or drug or drugs or "substance use" or substances or illicit or solvent or cocaine or marijuana* or cannab* or hashish or opium or opioid* or opiate* or heroin or amphetamine* or methamphetamine* or Ketamine or ecstasy or MDMA or "poly-drug" or polydrug or morphine or meth or methadone or methoxetamine))).ti. (356)

42   23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 (326520)

Combining the concepts together

43   22 or 42 (376951)

44   17 and 43 (6828)

45   limit 44 to yr="2004 -Current" (5658)

46   animals/ not (animals/ and humans/) (4526213)

47   45 not 46 (5561)

48   limit 47 to (comment or editorial) (51)

49   47 not 48 (5510)

50   limit 49 to English language (5348)

2) Search for remotely-delivered interactive interventions

This second search covers remote delivery using modes not covered in first search, and focused on alcohol or drug treatment or recovery, conducted on 24 November 2021.

Database: Ovid MEDLINE(R) ALL <1946 to November 23, 2021>

Search Strategy:

Terms for remote delivery, telephone and videoconferencing

1   (phone or phones or cellphone* or telephon* or video or videoconf* or videotelephon* or videophone* or telepresence or voip or skype or zoom or facetime* or "hangouts" or "google duo" or "talky core" or viber or tango or zoom or wechat or oovoo or Justalk or "Microsoft teams" or groupware or telecom* or "tele comm*" or telecounsel* or "tele counsel*" or telepsych* or "tele psyc*" or "video counsel*" or "video doctor*" or "video therap*" or avatar*).ti,ab,kw. (210148)

2   (remote* adj2 (commun* or deliver* or platform* or system* or administer* or support or feedback or messag* or advice or interact* or adviso* or service* or guid* or "self-guid*" or assist* or monitor* or chat* or tailor* or personal* or facilitate* or aid or aided)).ti,ab,kw. (11431)

Terms for interventions, treatment, recovery, service delivery

3   (Treatment or treating or counsel* or consultation* or management or therap* or intervention* or "self-help" or "self manag*" or "self care" or "self-guide*" or keywork or "key work" or keyworking or "keyworking" or groupwork or "group work" or "mutual aid" or "mutual help" or "psychology session*" or adherence or psychotherap* or program* or service* or Recovery or rehab* or detox* or withdraw* or (relapse adj3 prevent*) or (abstinence adj3 maint*) or (Transition* adj2 (support* or help*)) or "Motivational Interview*" or monitoring or Reinforcement or Aftercare or "after care" or "follow up care" or (follow* adj2 care) or (Support adj2 (group or forum or network or forums or groups or networks or peer or peers)) or Postdischarg* or discharge* or outpatient* or patient* or "Primary care" or "secondary care" or clinic or "momentary assessment" or biofeedback or (delivery adj3 care) or (delivery

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adj3 healthcare) or (telecounsel* or "tele counsel*" or telepsych* or "tele psyc*" or "video counsel*" or "video doctor*" or "video therap*")).ti,ab,kw. (13059071)

Controlled terms for remote delivery, telephone and videoconferencing, interventions, treatment, recovery, service delivery

4   telephone/ or answering services/ or videoconferencing/ (14705)

5   remote consultation/ (5403)

6   "delivery of health care"/ or after-hours care/ or "delivery of health care, integrated"/ or health services accessibility/ (192611)

7   aftercare/ or rehabilitation/ or transitional care/ (30423)

8   User-computer interface/ or treatment outcome/ or Telemedicine/ or Telerehabilitation/ or Precision medicine/ or patient care/ or rehabilitation/ or self care/ or Therapy, computer assisted/ or Secondary prevention/ or Tertiary prevention/ or Self help groups/ or Feedback, Psychological/ or Feedback, Sensory/ or Biofeedback, Psychology/ or Behavior Therapy/ or Neurofeedback/ or Mind-Body Therapies/ or Psychotherapy/ or Psychosocial Support Systems/ or Social Support/ or "Treatment Adherence and Compliance"/ or "Ecological Momentary Assessment"/ or evaluation studies as topic/ or pilot projects/ or feasiblity studies/ or program evaluation/ or benchmarking/ or Health Behavior/ or health risk behaviors/ or Feedback/ or Harm reduction/ or Patient Education as Topic/ or Motivational Interviewing/ (1829859)

9   (therapy or rehabilitation).fs. (2186453)

10   (remote* and (Treatment or treating or counsel* or consultation* or management or therap* or intervention* or "self-help" or "self manag*" or "self care" or "self-guide*" or keywork or "key work" or keyworking or "keyworking" or groupwork or "group work" or "mutual aid" or "mutual help" or "psychology session*" or adherence or psychotherap* or program* or service* or Recovery or rehab* or detox* or withdraw* or (relapse adj3 prevent*) or (abstinence adj3 maint*) or (Transition* adj2 (support* or help*)) or "Motivational Interview*" or monitoring or Reinforcement or Aftercare or "after care" or "follow up care" or (follow* adj2 care) or (Support adj2 (group or forum or network or forums or groups or networks or peer or peers)) or Postdischarg* or discharge* or outpatient* or patient* or "Primary care" or "secondary care" or clinic or "momentary assessment" or biofeedback or (delivery adj3 care) or (delivery adj3 healthcare))).ti. (6485)

Additional terms combining 'remote with interventions, treatment, recovery, service delivery

11   (remote* adj5 (Treatment or treating or counsel* or consultation* or management or therap* or intervention* or "self-help" or "self manag*" or "self care" or "self-guide*" or keywork or "key work" or keyworking or "keyworking" or groupwork or "group work" or "mutual aid" or "mutual help" or "psychology session*" or adherence or psychotherap* or program* or service* or Recovery or rehab* or detox* or withdraw* or (relapse adj3 prevent*) or (abstinence adj3 maint*) or (Transition* adj2 (support* or help*)) or "Motivational Interview*" or monitoring or Reinforcement or Aftercare or "after care" or "follow up care" or (follow* adj2 care) or (Support adj2 (group or forum or network or forums or groups or networks or peer or peers)) or Postdischarg* or discharge* or outpatient* or patient* or "Primary care" or "secondary care" or clinic or "momentary assessment" or biofeedback or (delivery adj3 care) or (delivery adj3 healthcare))).ti. (4756)

Terms for substance use or alcohol abuse

12   ((Substance adj2 ("use" or user* or usage or misuse or abuse* or misuse or depend* or addict* or disorder*)) or ((solvent* or drug or drugs) adj3 (addict* or abus* or misuse* or user or users or disorder* or dependen* or recovery or intoxicat* or withdraw* or detox* or habit* or recreation* or illicit or relapse)) or ((cocaine or marijuana* or cannab* or hashish or opium or opioid* or opiate* or heroin or amphetamine* or methamphetamine* or Ketamine or ecstasy or MDMA or "recreational drugs" or "illicit drugs" or "illicit substances" or "street drug" or "street drugs" or "poly-drug" or polydrug or morphine or meth or methadone or methoxetamine) adj2 (addict* or abus* or misuse* or user or users or disorder* or dependen* or recovery or intoxicat* or withdraw* or detox* or habit* or "use" or abstain* or abstinence or relapse or craving)) or ("club drug" or "club drugs" or "Drug using population" or "Drug using populations" or "who inject drugs" or "who use drugs") or "Drug problems" or "drug use").ti,ab,kw. or Street drugs/ or crack cocaine/ or designer drugs/ or substance-related disorders/ or Amphetamine-Related Disorders/ or cocaine-related disorders/ or inhalant abuse/ or marijuana abuse/ or opioid-related disorders/ or heroin dependence/ or morphine dependence/ or opium dependence/ or substance abuse, intravenous/ or phencyclidine abuse/ or substance abuse, oral/ or exp substance withdrawal syndrome/ or drug users/ (314809)

13   ((alcohol* adj3 (abus* or misuse* or disorder* or dependen* or treatment* or treating or recovery or therap* or addict* or problem* or hazardous or withdraw* or detox*)) or (Recovery adj3 (drinking or alcohol* or drinkers))).ti,ab,kw. or Alcohol/ or exp Alcohol-related disorders/ or alcoholism/ or alcoholics/ or exp Alcohol-Induced

Disorders/ or alcohol drinking/th or ((Alcoholic* not ((alcoholic adj1 beverage*) or (alcoholic adj1 drink) or (alcoholic adj1 drinks))) or alcoholism).ti,ab,kw. (187255)

Combining the concepts together

14   12 or 13 (464977)

15   1 or 2 or 4 or 5 (226107)

16   3 or 5 or 6 or 7 or 8 or 9 (13986232)

17   15 and 16 (157913)

18   10 or 11 (6485)

19   17 or 18 (161634)

20   14 and 19 (3996)

21   limit 20 to yr="2004 -Current" (3265)

22   animals/ not (animals/ and humans/) (4885166)

23   21 not 22 (3242)

24   limit 23 to english language (3167)

APPENDIX 3: RISK OF BIAS ASSESSMENTS FOR EACH STUDIES' OUTCOMES (N=42 STUDIES, N=50 OUTCOMES)

+	Low RoB	?	Some concerns	−	High RoB

Study	Outcomes	Domain 1. Risk of bias arising from the randomisation process	Domain 2. Risk of bias due to deviations from the intended interventions	Domain 3. Missing outcome data	Domain 4. Risk of bias in measurement of the outcome	Domain 5. Risk of bias in selection of the reported results	Overall risk of bias
1. Brooks (2010)*	Days of use	?	−	+	−	?	−
2. Budney (2015)†	Relapse	?	+	+	+	?	?
2. Budney (2015)†	Days of use	?	+	−	?	?	−
3. Campbell (2014)*†	Relapse	+	+	+	+	+	+
3. Campbell (2014)*†	Days of use	+	+	+	+	+	+
4. Carroll (2008)*	Days of use	?	?	−	−	?	−
5. Carroll (2014)*†	Relapse	?	?	+	?	?	?
5. Carroll (2014)*†	Days of use	?	?	+	+	?	?
6. Carroll (2018)	Days of use	+	?	+	?	?	?
7. Chaple (2016)*	Days of use	?	−	−	−	?	−
8. Christensen (2014)*	Days of use	?	+	+	+	?	?
9. DeMartini (2018)*	Relapse	+	+	+	+	?	?
10. Fals-Stewart (2010)*	Days of use	?	+	−	−	?	−
11. Farabee (2013)*†	Relapse	?	+	−	+	?	−
11. Farabee (2013)*†	Days of use	?	+	−	−	?	−
12. Farren (2014)*	Days of use	+	−	−	−	?	−
13. Godley (2010)*	Days of use	?	?	−	−	?	−
14. Gonzales (2014)*	Relapse	?	−	−	−	?	−

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Study	Outcomes	Domain 1. Risk of bias arising from the randomisation process	Domain 2. Risk of bias due to deviations from the intended interventions	Domain 3. Missing outcome data	Domain 4. Risk of bias in measurement of the outcome	Domain 5. Risk of bias in selection of the reported results	Overall risk of bias
15. Graser (2021)*	Relapse	?	+	+	−	?	−
16. Gustafson (2014)*	Relapse	+	+	−	−	?	−
17. Hubbard (2007)	Relapse	+	+	−	+	?	−
18. Johansson (2021)*	Days of use	+	+	+	+	−	−
19. Kiluk (2016)*	Days of use	+	?	+	?	?	?
20. Kiluk (2018a)*†	Relapse	?	?	−	+	?	−
20. Kiluk (2018a)*†	Days of use	?	?	−	−	?	−
21. King (2009)	Relapse	?	−	−	+	?	−
22. King (2014)	Relapse	?	−	−	+	?	−
23. Lucht (2020)*†	Relapse	+	+	+	?	?	?
23. Lucht (2020)*†	Days of use	+	+	+	?	?	?
24. Marsch (2014)	Days of use	?	?	−	+	?	−
25. McKay (2004)*†	Relapse	?	?	+	−	?	−
25. McKay (2004)*†	Days of use	?	?	+	−	?	−
26. McKay (2010)*	Relapse	+	?	+	?	?	?
27. McKay (2013a)*	Relapse	+	+	+	−	?	−
28. McKellar (2012)	Days of use	?	?	−	−	?	−
29. Moore (2013)	Relapse	?	+	+	+	?	?
30. Moore (2019)	Relapse	?	+	+	+	+	?
30. Moore (2019)	Days of use	?	+	−	−	+	−
31. Mundt (2006)*	Relapse	?	−	−	−	?	−
32. Nichols (2015)	Days of use	?	−	−	−	?	−
33. Paris (2018)*	Days of use	+	+	+	+	?	?

Study	Outcomes	Domain 1. Risk of bias arising from the randomisation process	Domain 2. Risk of bias due to deviations from the intended interventions	Domain 3. Missing outcome data	Domain 4. Risk of bias in measurement of the outcome	Domain 5. Risk of bias in selection of the reported results	Overall risk of bias
34. Scott (2020)	Days of use	+	+	+	−	?	−
35. Shi (2019)	Relapse	?	?	−	+	?	−
36. Tetrault (2020)*	Days of use	?	+	−	−	?	−
37. Tiburcio (2018)*	Days of use	+	?	−	−	?	−
38. Timko (2019a)*	Days of use	?	+	−	−	?	−
39. Timko (2019b)*	Days of use	?	+	−	−	?	−
40. Verduin (2013)*	Relapse	?	+	−	−	?	−
41. Wenze (2015)	Days of use	?	?	−	−	?	−
42. Wolitzky-Taylor (2018)*	Days of use	?	+	−	−	−	−

* Studies included in meta-analysis (N=29) † 8 studies measured both days of use and relapse – separate risk of bias assessments were made for each outcome and so these studies are listed in the table twice.

APPENDIX 4: OUTCOME EVALUATIONS EXCLUDED FROM META-ANALYSES

	Reason not included in meta-analysis
Bickel 2008	No usable data
Budney 2011	Non-randomised study
Budney 2015	Outcomes not extractable
Carroll 2018	Outcomes not extractable
DeFulio 2021	Non-randomised study
Hubbard 2007	Outcomes not extractable
Keoleian 2013	No usable data
King 2009	Outcomes not extractable
King 2014	Outcomes not extractable
Lucht 2014	Non-randomised study
Marsch 2014	Outcomes not extractable
McKellar 2012	Outcomes not extractable
Moore 2013	Outcomes not extractable
Moore 2019	Outcomes not extractable
Nahum-Shani 2017	No usable data
Nichols 2015	Outcomes not extractable
Scott 2020	Outcomes not extractable
Shi 2019	Outcomes not extractable
Stoner 2015	No usable data
Wenze 2015	Outcomes not extractable

APPENDIX 5: METHODS AND FINDINGS OF 2023 UPDATE

Update search methods

On completion of the original synthesis, an update of the search was conducted in July 2023, to ensure the evidence was as up to date as possible. This consisted of: 1) reference, related item, and citation searches in OpenAlex (5 July 2023) of 49 RCTs that were included in the original synthesis; and 2) update searches in Medline, PsycINFO, Social Science Citation Index (WoS) and Emerging Sources Citation Index (WoS) (14 July 2023). A user-built classifier was applied, based on the screening decision of records from the original systematic map (Burchett et al., 2022) that was designed to exclude records that were not digital interventions on drug and alcohol prevention, treatment and recovery from (exclusion of records at a score below 20). The Cochrane RCT classifier was applied to a subsample that had not already been indexed as 'randomised' in the databases (exclusion of records at score of below 10). A pragmatic decision to cease screening was taken after observing a plateau in the prioritised screening rate.

A subsequent update in August 2023 comprised of OpenAlex Keep-Up-To-Date recommender searches in EPPI-Reviewer (12 July and 21 August 2023 updates). The records identified were prioritised from the recommender in two ways: 1) user-built classifier and 2) auto-classifier. Screening was halted once it was clear no new relevant records were identified in the first 250 records.

Results of screening

From the update searches, a further 1,961 references were screened at title and abstract, with the full texts retrieved and screened for 57 references. This resulted in five new RCTs included in the review, as well as six other new papers that were linked to studies included in the original review (see figure A1).

Characteristics of newly included studies (n=5)

Two studies were conducted in the USA and one each in Ireland, Sweden and Turkey (see table A1 for details). Three targeted alcohol use, one targeted opioid use and one targeted a 'mixed' group of alcohol and/or drug use. Three studies measured days of use and three measured relapse outcomes (Kelpin et al. (2022) measured both days of use and relapse).

The five newly included studies evaluated seven remote interventions (one study evaluated three remote interventions (McKay et al. 2021), the remaining four each evaluated one). Most interventions (n=5) were ones evaluated in other studies in the original review: Kelpin et al. evaluated CBT4CBT, Hyland et al. evaluated iCBT, McKay et al. evaluated ACHESS and TMC (telephone monitoring and counselling); Taştekin et

al. evaluated a cognitive remediation intervention. The two interventions not evaluated in any other studies in the review were a combination of ACHESS and TMC evaluated by McKay et al. and a smartphone app, UControlDrink, evaluated by Farren et al. Three interventions were delivered parallel to inpatient or outpatient treatment; four were delivered when transitioning to a less intensive treatment or recovery support phase. Four interventions comprised self-guided therapy, one was remote recovery support, one was remote talking therapy and one was classified as 'other', since it comprised of both remote recovery support and remote talking therapy.

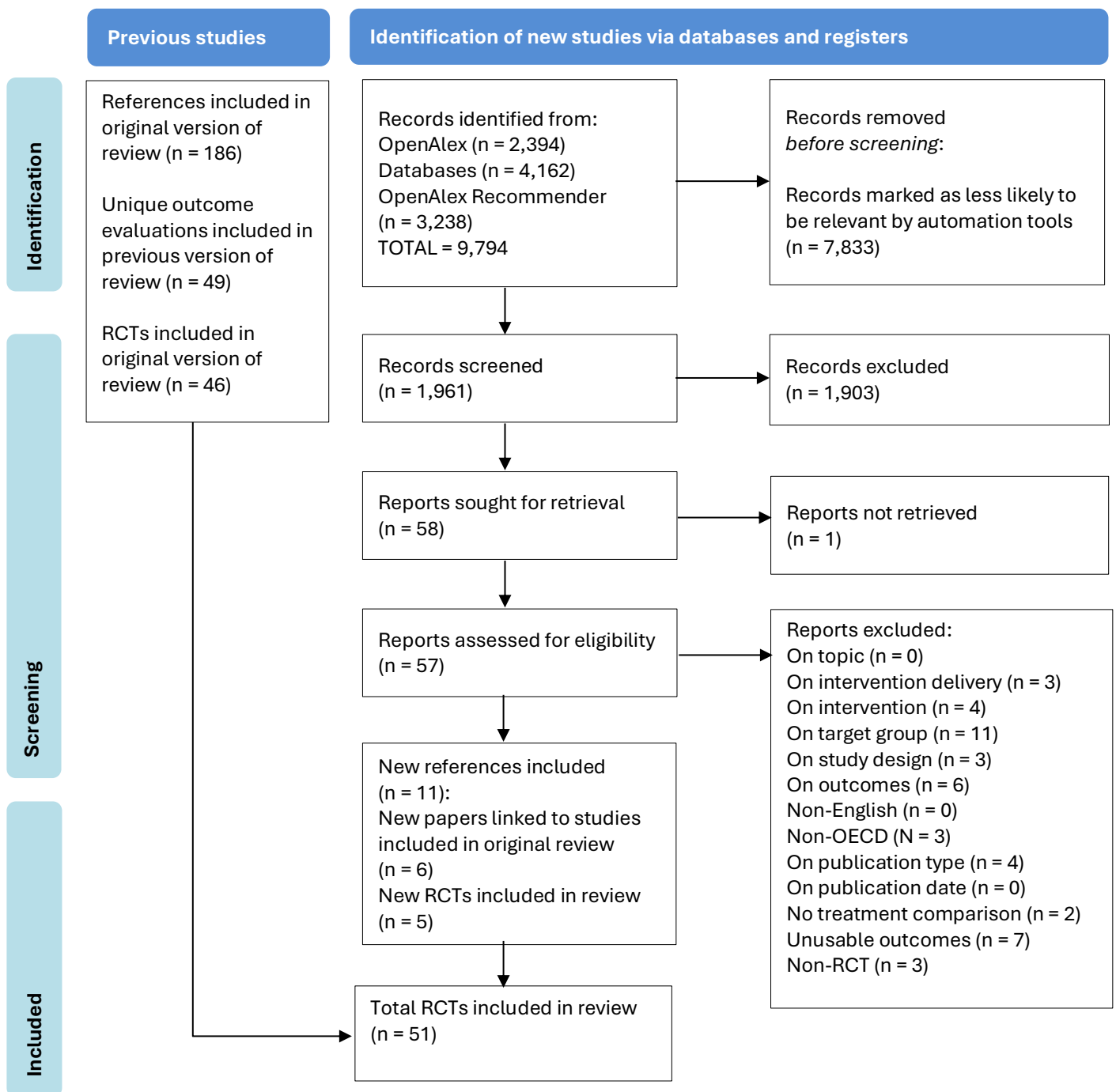Table A1: Characteristics of newly included studies (n=5)

Author / year Country	Aims	Participant characteristics	Intervention	Comparison/ evaluation type	Duration / Outcome timepoint	Outcomes	
						Relapse	Days of use
1. (Farren et al., 2022) Ireland	*To investigate treatment response to 6-month intervention with smartphone app, UControlDrink ... in a post-rehabilitation setting.*	**Population (N=111)** Inpatients completing dual diagnosis or alcohol and chemical dependency therapeutic programs. Mean age: ~45 years **Gender:** ~52% male **Ethnicity:** not reported Substance: Alcohol	**Intervention (N=54)** TAU + "UControlDrink" via smartphone app **Type** Self-guided therapy **Timing** When *transitioning* to a less intensive treatment or recovery support phase	Control (N=57) TAU Evaluation type superiority	Duration 6 months Outcome timepoint End of intervention	-	Days drinking

Author / year Country	Aims	Participant characteristics	Intervention	Comparison/ evaluation type	Duration / Outcome timepoint	Outcomes	
						Relapse	Days of use
2. (Hyland et al., 2023) Sweden	*To test the efficacy of an open-ended iCBT program for alcohol-dependent patients in primary care*	**Population (N=264)** Alcohol-dependent participants from 14 primary care centers. Mean age: 51 years **Gender:** 44% male **Ethnicity:** not reported Substance: Alcohol	Intervention (N=132) TAU+iCBT **Type** Self-guided therapy **Timing** *Parallel* to treatment and/or recovery support	Control (N=132) TAU Evaluation type: superiority	Duration 12 weeks Outcome timepoint End of intervention	-	Alcohol free days
3. (Kelpin et al., 2022) USA	*To conduct a pilot RCT comparing standard residential treatment plus access to the CBT4CBT program versus residential treatment alone (TAU).*	**Population (N=63)** Women admitted to a residential SUD treatment program. Mean age: 41 years Gender: 0% male **Ethnicity:** 79% Black/African American 14% White 7% other	Intervention (N=34) TAU+CBT4CBT **Type** Self-guided therapy **Timing** *Parallel* to treatment and/or recovery support	Control (N=29) TAU Evaluation type Superiority	Duration 3.5 weeks Outcome timepoint 12 weeks post-discharge	% relapse (any substance)	Days of substance use

Author / year Country	Aims	Participant characteristics	Intervention	Comparison/ evaluation type	Duration / Outcome timepoint	Outcomes	
						Relapse	Days of use
		Substance: mixed					
4. (McKay et al., 2021) USA	*To determine whether adding TMC, ACHESS or a combination of both to intensive outpatient programs (IOPs) improves outcomes for AUD*	**Population (N=262)** Adults recruited from four publicly funded intensive outpatient programs Mean age: 47 years **Gender:** 71% male **Ethnicity:** 82% African American Substance: Alcohol	Intervention (N=197) 3 intervention arms: Intervention 1 (N=59) TMC only **Type** Remote talking therapy Intervention 2 (N=68) ACHESS only **Type** Remote recovery support Intervention 3 (N=70) TMC+ACHESS **Type** other (remote talking therapy AND remote recovery support)	Control (N=65) TAU Evaluation type : Non-inferiority	Duration 12 months Outcome timepoint End of intervention	Participants with any alcohol use	-

Author / year Country	Aims	Participant characteristics	Intervention	Comparison/ evaluation type	Duration / Outcome timepoint	Outcomes	
						Relapse	Days of use
			Timing When *transitioning* to a less intensive treatment or recovery support phase				
5. (Taştekin et al., 2022) Turkey	*To investigate the effects of cognitive remediation applied to individuals diagnosed with opioid use disorder.*	**Population (N=53)** Individuals receiving Buprenorphine + Naloxone maintenance therapy for opioid use disorder in a hospital addiction clinic. Mean age: 30 years **Gender:** 100% male **Ethnicity:** Not reported Substance: Opioids	**Intervention (N=26)** TAU + computer-assisted cognitive remediation method **Type** self-guided therapy **Timing** *Parallel* to treatment and/or recovery support	Control (N=27) TAU Evaluation type Superiority	Duration 4 weeks Outcome timepoint 3 months	Relapse	-

Figure A1: PRISMA flow diagram for updated search

Previous studies

Identification of new studies via databases and registers

Identification

References included in original version of review (n = 186)

Unique outcome evaluations included in previous version of review (n = 49)

RCTs included in original version of review (n = 46)

Records identified from:
OpenAlex (n = 2,394)
Databases (n = 4,162)
OpenAlex Recommender (n = 3,238)
TOTAL = 9,794

Records removed *before screening*:

Records marked as less likely to be relevant by automation tools (n = 7,833)

Records screened (n = 1,961)

Records excluded (n = 1,903)

Screening

Reports sought for retrieval (n = 58)

Reports not retrieved (n = 1)

Reports assessed for eligibility (n = 57)

Reports excluded:
On topic (n = 0)
On intervention delivery (n = 3)
On intervention (n = 4)
On target group (n = 11)
On study design (n = 3)
On outcomes (n = 6)
Non-English (n = 0)
Non-OECD (N = 3)
On publication type (n = 4)
On publication date (n = 0)
No treatment comparison (n = 2)
Unusable outcomes (n = 7)
Non-RCT (n = 3)

New references included (n = 11):
New papers linked to studies included in original review (n = 6)
New RCTs included in review (n = 5)

Included

Total RCTs included in review (n = 51)

Risk of bias of newly included studies (n=5)

One study (Kelpin et al. 2022) reported both outcomes selected for synthesis; meaning that a total of six outcomes were assessed for risk of bias. As illustrated in Table A2 below, no outcomes were judged overall to be at low risk of bias, four were at high risk, and two outcomes from one study (Kelpin et al. 2022), were judged to have some concerns. Of note, we had significant concerns about the study by Taştekin et al. (2022). Our main concern was that randomised study participants were excluded from the analysis 'due to relapse or failure to communicate' prior to the first follow up. However, since the authors noted that at the second follow up participants who could not be contacted were considered to have relapsed, we included these participants when extracting data. Nevertheless, the reporting of this study challenged us to be confident about how it was executed; for example, relapse for the first follow-up (end of intervention) was not reported so we had to use data for the follow-up period.

Table A2: Risk of bias of newly included studies

Study	Outcomes	Domain 1. Risk of bias arising from the randomisation process	Domain 2. Risk of bias due to deviations from the intended interventions	Domain 3. Missing outcome data	Domain 4. Risk of bias in measurement of the outcome	Domain 5. Risk of bias in selection of the reported results	Overall risk of bias
1. Farren (2022)	Days of use	?	+	—	?	+	—
2. Hyland (2023)	Days of use	+	+	—	?	—	—
3. Kelpin (2022)	Days of use	?	+	+	?	+	?
3. Kelpin (2022)	Relapse	?	+	+	?	+	?
4. McKay (2021)	Relapse	?	—	—	—	—	—
5. Taştekin (2022)	Relapse	?	—	—	—	?	—

# Update of Analysis 1: intervention effects of newly included studies

Summary of intervention effectiveness update

- **Analysis 1 addressed the question:** How effective are interactive remote therapies for reducing drug/alcohol use?
- The update provided evidence to supplement three of the four original effectiveness syntheses
- The direction of findings remained the same, remote therapies were found to be effective, and the magnitude of effects was little changed in all updated synthesis
- Of the five newly identified trials, four were found to be at high risk of bias and one (which measured two outcomes) was found to have some concerns

Effectiveness synthesis #1: Are people who receive <u>remote therapy as a supplement to in-person treatment and/or recovery support less likely to relapse</u> than those who receive in-person care alone?

The inclusion of two additional interventions (Kelpin et al., 2022; Taştekin et al., 2022) in the updated synthesis resulted in a small change in the pooled effect estimate (see figure A2). The original synthesis, based on 15 interventions, found that the odds of relapse were 30% lower among people who received remote therapy in addition to in-person treatment and/or recovery support than those who received in-person care alone [OR 0.70 CI 0.57-0.86]. The updated synthesis with 17 interventions showed the odds of relapse to be 39% lower [OR 0.61 CI 0.46-0.81].

Figure A2: Effectiveness synthesis #1 update – meta-analysis (n=17 remote therapy interventions)
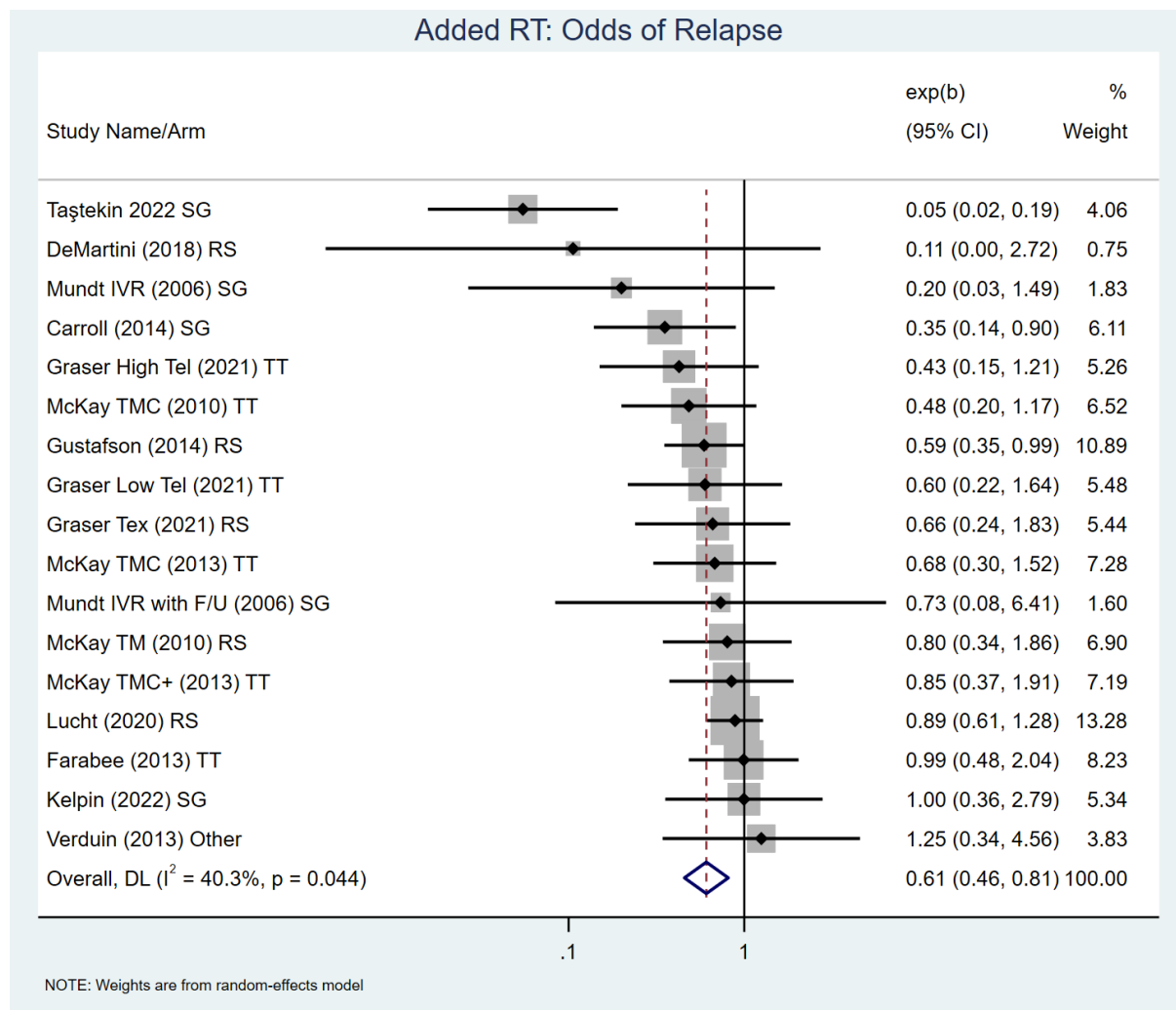
An update of the sub-group analysis by intervention type also showed slight changes to the outcomes. Both additional interventions were self-guided therapy. In the original sub-group analysis (see figure 7) the pooled estimate for self-guided therapy interventions was significant but had wide confidence intervals indicating uncertainty about effects (n= 3 interventions, OR 0.36 CI 0.16-0.78). The addition of the two additional interventions (Kelpin et al., 2022; Taştekin et al., 2022) showed a greater reduction in the odds of relapse among those who received the remote therapy intervention compared to controls (64% in the original review vs 69% in the update), but the confidence intervals remained very wide (n= 5 interventions, OR 0.31 CI 0.10-0.91). The I^2 statistic (69.6%) indicates substantial statistical heterogeneity; i.e. the results are uncertain because the magnitude of effect seen in individual studies is so inconsistent.

The update of the sub-group analysis to identify whether outcomes differed depending on the substance focus of the interventions (see original sub-group analysis in figure 8) resulted in very minor changes. In the original sub-group analysis, the groups of

interventions targeting mixed drug/alcohol populations (n=3 interventions, OR 0.61 CI 0.58-1.00) and populations using drugs only (n=1 intervention, OR 0.99 CI 0.48-2.04) did not result in statistically significant effects. The updated findings remained non-significant even with the addition of Kelpin et al., 2022 to the group focused on mixed populations (n= 4 interventions, OR 0.67 CI 0.43-1.04) and with Taştekin et al., 2022 added to the group focused on drugs (n=2 interventions, OR 0.44 CI 0.08-2.48). The available evidence is thus still unable to indicate whether adding remote therapy to in-person care for reducing relapse is suited to a particular type of substance use.

The update of the sub-group analysis by intervention timing (see original sub-group analysis in figure 9) also resulted no change to the overall conclusions. The findings of the original sub-group analyses did not show a clear difference between groups because the 'parallel' sub-group pooled estimate was based on just three trials and displayed high statistical heterogeneity (I^2 40.2%). The update added two new trials to the 'parallel' subgroup [OR 0.51 CI 0.17-1.52]; but since the additions further increased the statistical heterogeneity to a very high level (I^2 75.7%) clear conclusions about the differential effect of intervention timing on relapse are still unable to be drawn.

Effectiveness synthesis #2: Do people who receive in-person treatment and/or recovery support <u>supplemented with</u> remote therapies have <u>fewer days of drug or alcohol use</u> than those who receive in-person care alone?

The original synthesis of 14 interventions showed that those receiving remote therapy as a supplement to in-person treatment and/or recovery support fewer days of drug or alcohol use compared to those who received in-person care alone [SMD -0.21 CI -0.33, 0.00]. The updated synthesis (see Figure A3 below) which included three further interventions (Farren et al. 2022, Hyland et al. 2023, Kelpin et al. 2022) showed a slightly reduced impact on days of drug or alcohol use among those who received remote therapies; fewer days of drug or alcohol use among those receiving remote therapy plus in-person treatment and/or recovery support compared to those receiving in-person care alone [SMD -0.18 CI -0.28, -0.08].

Figure A3: Effectiveness synthesis #2 update – meta-analysis (n=17 remote therapy interventions)
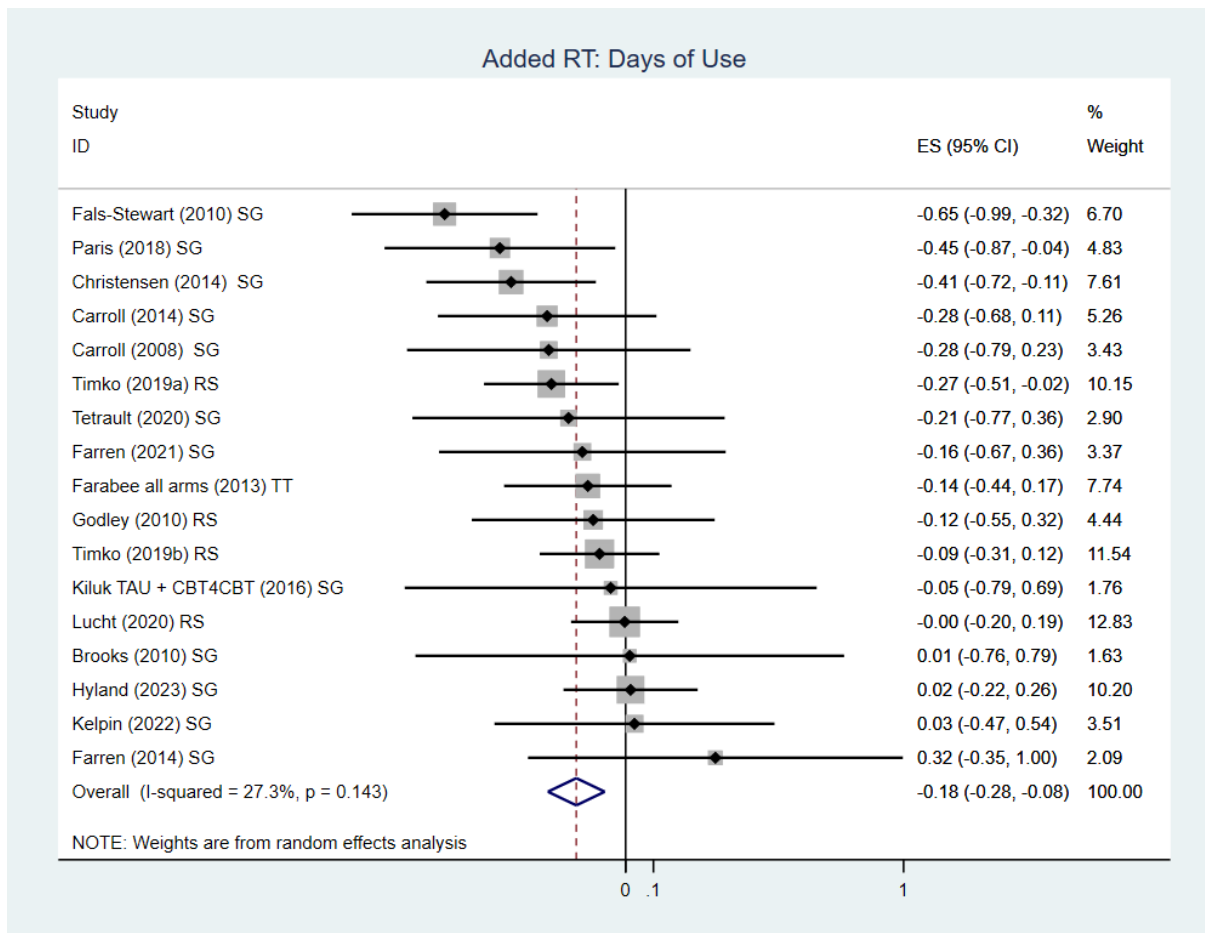
An update of the sub-group analysis by remote therapy type was little changed. All three interventions were self-guided therapy, so this was the only subgroup affected. The original finding (see figure 11 in section 3) showed that those receiving self-guided therapy compared to controls showed fewer days of use (n=9 interventions, SMD -0.34 CI -0.50, -0.17); the updated finding suggested this impact had attenuated but self-guided therapy remained effective (n=11 interventions, SMD -0.23, CI -0.39, -0.07). However, there remained no clear evidence that self-guided therapy was more-or-less effective than other intervention modes.

An update of the sub-group analysis by substance focus was also little changed. Two of the new interventions were delivered to mixed-drug/alcohol use populations; the original finding showed fewer days of use for this sub-group [n= 8 interventions, SMD -0.28, CI -0.42, -0.14] and the updated finding showed little change and continued to indicate fewer days of use [n=10 interventions, SMD -0.22, CI -0.36, -0.08]. The addition of one new intervention did not change the finding of no significant difference between intervention recipients and controls for the sub-group of studies on alcohol
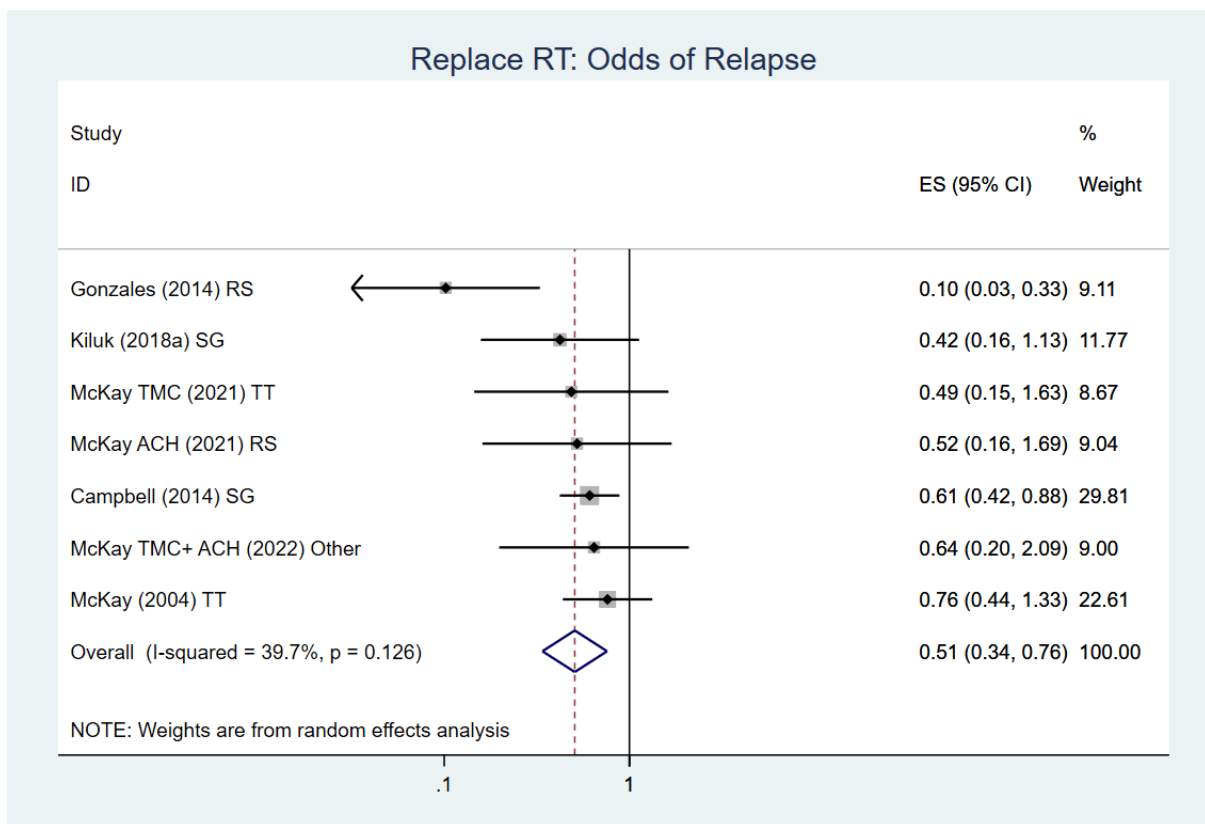
use; original finding [n=3 interventions, SMD 0.02, CI -0.16, 0.20], updated finding [n=4 interventions, SMD -0.00, CI -0.17-0.17].

The original sub-group analysis examining intervention timing (figure 13) did not indicate clear difference in effect since the two pooled effect estimates overlapped. The addition of two new studies to the sub-group of parallel interventions changed the pooled effect estimate slightly from [SMD -0.34, CI -0.50, -0.17] to [SMD -0.23, CI -0.40, -0.06], but since this still overlapped with the pooled estimate for transitioning interventions [SMD -0.11, CI -0.22, 0.00] the conclusion remains that intervention timing does not appear to lead to differential effects.

Effectiveness synthesis #3: Are people who receive <u>remote therapies as a replacement or partial replacement</u> for in-person treatment and/or recovery support <u>no more likely to relapse</u> than those who receive in-person care?

The original meta-analysis of four interventions found that odds of relapse were 55% lower among those receiving remote therapy compared to controls [OR 0.45 CI 0.24-0.84]. With the addition of the three interventions evaluated by McKay et al. 2021, the precision of the findings was slightly improved but the odds of relapse among those receiving remote therapy compared to controls were found to be slightly less favourable at 49% lower [OR 0.51 CI 0.34-0.76] (see figure A4). The number of interventions remained too limited to conduct sub-group analyses.

Figure A4: Effectiveness synthesis #3 update – meta-analysis (n=7 remote therapy interventions)

Replace RT: Odds of Relapse

Study ID	ES (95% CI)	% Weight
Gonzales (2014) RS	0.10 (0.03, 0.33)	9.11
Kiluk (2018a) SG	0.42 (0.16, 1.13)	11.77
McKay TMC (2021) TT	0.49 (0.15, 1.63)	8.67
McKay ACH (2021) RS	0.52 (0.16, 1.69)	9.04
Campbell (2014) SG	0.61 (0.42, 0.88)	29.81
McKay TMC+ ACH (2022) Other	0.64 (0.20, 2.09)	9.00
McKay (2004) TT	0.76 (0.44, 1.33)	22.61
Overall (I-squared = 39.7%, p = 0.126)	0.51 (0.34, 0.76)	100.00

NOTE: Weights are from random effects analysis

Effectiveness synthesis #4: Do people who receive <u>remote therapy as a replacement or partial replacement</u> for in-person treatment and/or recovery support have <u>no more days of drug or alcohol use</u> than those who receive in-person care?

An update to effectiveness synthesis #4 was not possible since none of the studies identified in the update examined remote therapy as a replacement for in-person treatment and/or recovery support and measured days of drug or alcohol use.

Update of Analysis 2: intervention features of newly included studies

Summary of intervention features update

- **Analysis 2 addressed the question:** Which intervention and implementation features of remote therapies are associated with greater reductions in drug/alcohol use?
- The update identified one additional most effective intervention, two least effective interventions and four which were neither most nor least effective.
- The update findings were broadly consistent with the original findings on intervention features.

Cases and outcome sets

As described in section 2.9.1 interventions categorised as most or least effective were eligible cases for inclusion in analysis 2. One intervention identified in the search update met the criteria to be included in the most effective set (Taştekin et al. 2022), although because of significant concerns about the methodology and reporting of this study (see Risk of Bias section above) our confidence in this outcome was low. Two studies evaluated interventions that were categorised as least effective for reducing days of use (Hyland et al., 2023; Kelpin et al., 2022), although one of these (Kelpin et al., 2022), also reported risk of relapse as an outcome, which was neither most nor least effective. Four interventions, in the remaining two studies, were neither most not least effective (Farren et al., 2022; McKay et al., 2021). Because so few interventions were eligible to be included as most or least effective cases, we have not re-run the QCA analyses. However, below we report and consider the configurations for each of the seven interventions and whether these are consistent with the original findings.

Configurations

As described in section 3.3, and summarised in Table A3 below, the original QCA focused on configurations of conditions reflecting three key principles.

Table A3: Summary of key principles and conditions supporting them

Principle	To address this principle interventions needed to:
Principle 1 – meeting treatment and recovery needs	Offer an appropriate level of service AND motivate abstinence *OR* Offer an appropriate level of service AND be delivered to those with higher severity DAUD
Principle 2 – taking a person-centred approach	Address the needs of a *specific* cultural group (targeted) *OR* Meet individual needs and preferences (personal touch)
Principle 3 – maximising service use	Support in-*person* treatment and/or recovery support *OR* Motivate use of other services

The original synthesis identified that meeting treatment and recovery needs (Principle 1) appears to be a necessary but not sufficient principle underpinning the most effective remote therapies; the most effective remote therapies also either took a person-centred approach (Principle 2) and/or supported use of other services (Principle 3). As demonstrated in the data table below (Table A4) the findings of the update were broadly consistent with this.

Interpretation

The two least effective interventions (Hyland et al., 2023; Kelpin et al., 2022) failed to meet the conditions for all three principles. Of the interventions categorised as neither most nor least effective, one met the conditions for Principles 2 and 3 but did not meet the conditions for the meeting needs principle (McKay et al.'s TMC + ACHESS). The remaining three interventions met the conditions for one principle only (McKay et al. TMC, McKay et al. ACHESS and Farren et al.). These findings are entirely consistent with the original synthesis findings.

However, the configuration in the most effective intervention (Taştekin et al. 2022) was inconsistent with the original review findings. As detailed in Table A4, this intervention met the conditions for maximising service use (Principle 3) only; it did not meet the conditions for meeting treatment and recovery needs (Principle 1) nor the conditions for taking a person-centred approach (Principle 2). This intervention was similar to an intervention included in the original QCA, which was also 'most effective' (Fals-Stewart & Lam, 2010). Both interventions were designed to address cognitive impairment prior to treatment to enhance treatment engagement, rather than to

address DAUD directly, and are the only examples of this approach in the review. The interventions had identical configurations for Principles 2 and 3, but differed on a single condition for Principle 1. Both interventions met the conditions for maximising service use (Principle 3) by being designed to support in-person treatment. Neither intervention involved a person-centred approach (Principle 2); however, as theorised in section 3.3.8, addressing cultural or individual preferences may be less relevant in cognitive remediation interventions than in interventions that address DAUD directly. With regards to meeting needs (Principle 1) neither intervention was designed to motivate abstinence (since they did not directly address DAUD) and both were delivered to participants with higher severity DAUD; however, whilst the intervention evaluated by Fals-Stewart & Lam was delivered at an appropriate level (i.e. for more than five weeks), the one evaluated by Taştekin et al. 2022 was only delivered for four weeks and therefore did not meet the conditions for Principle 1. It may be that cognitive rehabilitation interventions do not require to be delivered for as long as other types of self-guided therapy but given that we only identified two cognitive rehabilitation interventions we do not feel we have sufficient evidence to warrant a revision to the condition.

The findings about the features of the seven interventions in the update are therefore broadly consistent with the findings about intervention features in the original review.

Table A4: Data table of intervention features for newly included studies

Study	Most effective remote therapy	Least effective remote therapy	Higher severity DAUD	Remote therapy motivates abstinence	Appropriate level of remote therapy	Personal touch	Targeted	Supports in-person treatment and/or recovery	Motivates use of other services
Farren (2022)	0	0	0	1	1	0	0	0	0
McKay ACHESS (2022)	0	0	0	0	1	0	0	1	1
McKay TMC (2022)	0	0	0	0	0	1	0	0	0
McKay TMC+ ACHESS (2022)	0	0	0	0	1	1	0	1	1
Taştekin (2022)	1	0	1	0	0	0	0	1	0
Hyland (2023)	0	1	0	0	1	0	0	0	0
Kelpin (2022)	0	1*	0	0	0	0	0	0	0

* least effective for 'days of use' outcome; neither most nor least effective for 'risk of relapse' outcome

Update of Analysis 3: population equity details of newly included studies

Summary of intervention population equity update

- **Analysis 3 addressed the question:** Are changes in drug/alcohol use resulting from remote therapies consistent across different population groups?
- The update identified no studies that reported whether findings varied by population equity-related characteristics
- The update findings were consistent with the original population equity findings in that they all excluded people with mental health conditions and rarely reported characteristics beyond age and gender.

Studies' exclusion criteria

All five studies found in the search update employed eligibility criteria to exclude particular groups. As with the original set of studies, notable exclusions were people with mental health conditions (n=5) and those with cognitive impairment (n=4). Three of the five studies employed upper age limits (Farren et al., 2022; McKay et al., 2021; Taştekin et al., 2022) and one only included women (Kelpin et al. 2022).

Studies' included populations

Gender and age were reported in all five studies. Two of the studies were single sex; one only included women (by design) (Kelpin et al., 2022), the other only succeeded in enrolling men onto the trial (Taştekin et al., 2022). All five studies reported the place of participant recruitment such as hospitals or residential facility rather than the actual place of residence. Two studies reported ethnicity and in both instances the sample consisted of >80% Black/African Americans (Kelpin et al., 2022; McKay et al., 2021). Education, social capital, occupation, mental health, digital access/literacy and other factors were not reported by all five studies, and where they were reported various measures/indicators were used. None of the five studies reported participant characteristics related to disability, SES, religion or sexual orientation.

Studies' reporting of outcomes by sub-group

In none of the five studies was sub-group analysis conducted to assess whether intervention effects varied by key population equity-related characteristics.

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