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Review

Effective behaviour change techniques for family and close friends: A systematic review and meta-analysis across the addictions

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ABSTRACT

This systematic review aimed to determine whether the use of specific behaviour change technique (BCT) groups are associated with greater effectiveness for psychosocial interventions delivered to family and close friends (FCFs) impacted by addiction. A systematic search of peer-reviewed and grey literature published until August 2021 identified 32 studies in 38 articles. An established BCT taxonomy (93 BCTs clustered into 16 groups) was adapted (inclusion of seven additional BCT groups) and applied to 57 interventions. The meta-analyses indicated that some, but not all, FCF outcomes were improved by the exclusion of BCTs within several groups (*Reward and Threat*, *Scheduled Consequences*, *Confrontation of the Addicted Person to Engage in Treatment*, and *Goals and Planning*) and inclusion of BCTs within the *Restoring a Balanced Lifestyle* group. Addicted person outcomes were improved by the inclusion of some BCTs within several groups (*Repetition and Substitution*, *Reward and Threat*, *Scheduled Consequences*, and *Restoring a Balanced Lifestyle*). Relationship functioning outcomes were improved by the inclusion of BCTs within the *Confrontation of the Addicted Person to Engage in Treatment* group. Future research involving the development and evaluation of numerous interventions or comprehensive multi-component interventions that can address the various needs of FCFs, without counteracting them, is required.

1. Introduction

A growing body of research has demonstrated the similarities between substance use disorders and behavioural addictions (Grant & Chamberlain, 2016; Petry, 2010; Rash, Weinstock, & Van Patten, 2016; Wareham & Potenza, 2010). Due to this, substance-based (i.e., alcohol use, illicit drug use) and gambling disorders have been classified together within the Substance-Related and Addictive Disorders category in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; (American Psychiatric Association, 2013), with internet gaming disorder classified as a condition for further research. Addictive disorders are of major public health concern as they are associated with negative consequences not just for the individuals, but also their family and friends, and the community (Room, Babor, & Rehm, 2005; Shaffer & Korn, 2002; Volkow, Poznyak, Saxena, Gerra, & Network, 2017). International estimates indicate that a large proportion of the population have experienced at least one harm due to someone else's drinking (13–78%; Laslett et al., 2019), illicit drug use (13–28%; Melberg et al., 2011) or gambling problems (2–19%; Dowling, Hawker, Rodda, & Hodgins, 2021). There is growing evidence that family and close friends (FCFs) report considerable harms across multiple domains, including emotional or psychological distress; relationship disruption, conflict or breakdown; physical harm and decrements to health; financial harm; criminal activity or reduced performance at work or study (Dowling, Hawker, Rodda, & Hodgins, 2021; Dowling, Rodda, Lubman, & Jackson, 2014; Langham et al., 2016; Laslett et al., 2011; Stanesby et al., 2018; Wenzel, Øren, & Bakken, 2008).

Given the prevalence and extent of harms experienced, there has been increasing acknowledgement of the treatment needs of these FCFs in their own right (Dowling, Hawker, Merkouris, Rodda, & Hodgins, 2021; Dowling, Hawker, Rodda, & Hodgins, 2021; Templeton, Velleman, & Russell, 2010) and a corresponding increase in research effort evaluating intervention options that are delivered to the FCFs without relying on the presence of the addicted person. FCF-delivered interventions differ from interventions that solely involve the FCF in interventions directed towards the addicted person (i.e., family-involved

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interventions) or interventions that work conjointly with the addicted person and the FCF (i.e., family systems interventions, such as couples therapy). The aims of FCF–delivered interventions can be two-fold: (1) help the FCF support the addicted person engage with treatment or reduce their addictive behaviour (i.e., FCF-delivered interventions with an addicted person focus); and/or (2) help the FCF manage the harms of the addicted person's behaviour (i.e., FCF-delivered interventions with a FCF focus; (Copello, Velleman, & Templeton, 2005; Rodda, Dowling, Thomas, Bagot, & Lubman, 2019; Templeton et al., 2010). Despite increasing recognition of the importance to address the needs of FCFs impacted by addiction, the majority of the interventions evaluated across the addiction literature have been family-involved or family systems interventions, therefore relying on the presence of the addicted person (Kourgiantakis, Ashcroft, Mohamud, Fearing, & Sanders, 2021).

To date, only one systematic review and meta-analysis has focused solely on evaluating the effectiveness of FCF-delivered psychosocial interventions (Merkouris, Rodda, & Dowling, 2021). Findings from 20 randomised controlled trials (RCTs), revealed that most FCF-delivered interventions address both FCF-focused and addicted person-focused aims, with fewer studies evaluating interventions with only a FCF or addicted person focus. Meta-analytic findings revealed that, when compared to control groups, psychosocial interventions resulted in better outcomes on some FCF outcomes (i.e., depressive symptomatology, life satisfaction and coping style; but not addiction-related harms, psychological distress nor anxiety symptomatology), as well as addicted person (i.e., treatment entry but not frequency of use) and relationship functioning outcomes (i.e., marital discord; Merkouris et al., 2021). Given the variability in the evaluated interventions and their associated aims (i.e., addicted person-focused, FCF-focused, or a combination of both), this review was unable to determine whether any one intervention type was most effective in the treatment of affected others. In order to improve the effectiveness of interventions for FCFs impacted by addiction, research into the specific components of FCF-delivered interventions that can effectively address each intervention aim may enhance the development of interventions that can be tailored to individual FCF needs (Templeton et al., 2010).

One such approach involves the use of developed taxonomies of behaviour change techniques (BCTs), which can be used to classify and identify the specific components of the available interventions that are more or less effective in assisting with behaviour change. In this context, BCTs refer to the 'active ingredients' in an intervention that assist in the regulation of the target behaviour (Michie et al., 2013). Using international experts in behaviour change, (Michie et al., 2013) developed the first extensive and consensually agreed upon hierarchically structured taxonomy of BCTs, which consists of 93 BCTs that sit within 16 groups (e.g., goals and planning, social support, repetition and substitution). The taxonomy by Michie et al. (2013) has been applied to multiple health and mental health domains (e.g., (Gardner, Smith, Lorencatto, Hamer, & Biddle, 2016; Lyons, Lewis, Mayrsohn, & Rowland, 2014). Despite a rise in the development and application of BCT taxonomies in the addictions, such taxonomies have only ever been applied to behaviour change interventions delivered to the addicted person (e.g., (Humphreys, Evans, Makin, Cooke, & Jones, 2021; Michie et al., 2012; Rodda et al., 2018).

1.1. Aims

While there is a growing body of evidence relating to the effectiveness of psychosocial interventions for the family and friends affected by addiction, little is known about the active ingredients of these interventions that may differentiate between effective and ineffective interventions. By applying an established taxonomy of BCTs to psychosocial interventions delivered to FCFs impacted by addiction, this study aims to: (1) identify the frequency of the BCT groups present in the available psychosocial interventions; and (2) determine whether the use of specific BCT groups in these interventions are associated with greater intervention effectiveness.

2. Methods

This systematic review and meta-analysis adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, & Altman, 2009) and was registered with PROSPERO (CRD42021252049).

2.1. Search strategy

This review drew upon a systematic search conducted by members of the current review team, which was designed to explore the effectiveness of psychosocial interventions for FCFs impacted by addiction (Merkouris et al., 2021). This systematic search involved: (1) an electronic database of the some of the most common psychological, medicinal, health and social care databases (Medline, PsycInfo, CINAHL and EMBASE); (2) a grey literature search of Google in which the first 10 pages (i.e., 100 citations) were examined; and (3) a manual search of the reference lists of all included articles. See Appendix A for the search strategy.

2.2. Eligibility criteria

Studies were eligible for inclusion in the current review if: (1) they evaluated the effectiveness of an intervention delivered to individuals primarily affected by someone else's alcohol use, substance use, gambling or gaming (i.e., FCF-delivered interventions with an addicted person-focused and/or FCF-focus); (2) they were RCTs or controlled trials with any control or comparison group; (3) the FCF and the addicted person were 18 years of age or older; (4) the intervention was psychosocial in nature; (5) a sufficient description of the intervention was provided to enable classification of BCTs; (6) at least one outcome measure related to the FCF(depression, psychological distress, anxiety, coping, life satisfaction or addiction-related harms), addicted person (frequency of use or treatment entry) or relationship functioning (marital/relationship discord) was employed; and (7) the article was reported in a complete manuscript outlining original work published until 12 September 2022.

Studies were excluded if: (1) a composite addictive disorder and mental health sample (e.g., FCF of problem alcohol use and/or depression) was employed, whereby the data for the addictive disorder sample were not analysed separately; (2) the target of the intervention was the individual experiencing issues with alcohol, substances, gambling or gaming and only included the involvement of the FCF for the purpose of helping or supporting the addicted person (i.e., family-involved intervention); (3) the intervention was couples therapy or family therapy (i.e., family systems intervention); (4) the intervention was only pharmacological, neurobiological, confrontative (i.e., an 'intervention' where affected others confront the individual in the hope of engaging him/her into treatment) or a non-therapeutic group (e.g., 12-step programs); (5) the intervention was delivered to affected others but related to prevention of use rather than tertiary intervention (e.g., parents of college students trying to prevent the uptake/use of drinking behaviour); and (6) the article was a qualitative report, a review, a case study, a conference proceeding, an abstract, an editorial, a dissertation, a book or book chapter or protocol paper. Four reviewers were independently involved in the identification of included studies, with double screening conducted for one-third of the studies identified by the search. Discrepancies were resolved through group discussion, with a third reviewer acting as arbiter when required.

2.3. Data extraction, risk of bias assessment and BCT coding

A standardised data extraction sheet was used to extract and collate relevant data from the included studies. This included information

relating to: (1) study descriptives (e.g., country, year of publication, age and gender of participants); (2) the intervention (e.g., mode of delivery, number of sessions); and (3) the outcomes (e.g., measures employed, data for the meta-analysis including sample size, means and standard deviations for continuous outcomes and events and sample sizes for categorical outcomes).

The revised Cochrane risk of bias tool for randomised trials (version 2.0; Sterne et al., 2019) was employed to assess risk of bias in the included studies. This tool evaluates bias across five domains, including the randomisation process, deviations from the intended treatment, missing outcome data, outcome measurement and reported result selection. Studies are categorised as having a low risk of bias, some concerns or high risk of bias on each of these domains. These domain-level judgements are then utilised to determine whether each study is considered to have an overall low risk of bias, some concerns or a high risk of bias.

Michie et al.' (2013) BCT taxonomy (v1) was utilised to code the BCTs in the included interventions. This taxonomy consists of 93 techniques that are clustered into 16 groups, including: (1) goals and planning; (2) feedback and monitoring; (3) social support; (4) shaping knowledge; (5) natural consequences; (6) comparison of behaviour; (7) associations; (8) repetitions and substitution; (9) comparison of outcomes; (10) reward and threat; (11) regulation; (12) antecedents; (13) identity; (14) scheduled consequences; (15) self-belief; and (16) covert learning.

Given such a taxonomy has not previously been applied to samples of FCFs, the established taxonomy was adapted to include examples and coding rules specific to this content area. In addition, where intervention components did not meet the definitions associated with any of the 93 established techniques, additional techniques were created during the coding process. Where possible, these techniques were clustered into groups of BCTs to align with the original taxonomy or additional groups were created to reflect the content of included studies. For example, techniques used to develop communication skills were coded as individual techniques (e.g., assertive communication), after which they were grouped into a higher order category (i.e., communication training). Only BCT groups that were employed in a minimum of five interventions were included in the final BCT coding dictionary. Table 1 presents the descriptions and frequency of the 23 BCT groups employed in the current study, based on how they were applied to this FCF intervention literature. Appendix B presents the individual-level BCT coding dictionary employed in the current study.

BCTs were coded only where there was an explicit statement that they were delivered as part of the study. Where the included articles did not provide sufficient detail to enable coding of the BCTs, other publicly available publications, such as protocol papers, were sourced and utilised. The coding rules and adaptations to the taxonomy were developed by two authors and approved by all authors. Two reviewers were then independently involved in the data extraction, risk of bias assessment and BCT coding process, with double data extraction and coding conducted for one-third of included articles. Discrepancies were resolved through group discussion, with a third reviewer acting as arbiter when required.

2.4. Meta-analysis

The meta-analyses were developed in accordance with Albarracín et al. (2005). The main analysis for the current review used univariate random-effects models to examine the extent of change within intervention conditions, from pre-intervention to immediately post-intervention, for each FCF (depression, psychological distress, anxiety, coping, life satisfaction, addiction-related harms), addicted person (frequency of use) and relationship functioning (marital discord) outcome.

All analyses were conducted in R (R Core Team, 2021), using the metafor package (Viechtbauer, 2010). Effect sizes used in these analyses

Table 1
Description and frequency of BCT groups in the included affected other interventions.

BCT group label	BCT group definition	n	%
1. Goals and planning	Behavioural and outcome goals are set or agreed upon. Behavioural contracts and action plans are used to specify agreed behaviour. Triggers of behaviour are identified and strategies to overcome obstacles are developed. Goals and plans are reviewed at specified intervals.	30	52.6
2. Monitoring and feedback	Monitoring or self-monitoring of behaviour or outcomes of behaviour, with or without the provision of feedback is conducted.	19	33.3
3. Social support	Practical help is arranged or provided in order to practice or perform the desired behaviour. A person is identified that can provide emotional support.	17	29.8
4. Shaping knowledge	Information on the antecedents (e.g., triggers and high-risk situations), nature of addiction, treatment and the change process is provided. Alternative explanations for the causes of the behaviour, and information on how to perform the desired behaviour is provided. Testing hypotheses about the behaviour, its causes and consequences is conducted by collecting and interpreting data.	48	84.2
5. Natural consequences	Information on the health, social, environmental and emotional consequences of performing the behaviour is provided. These consequences are emphasised, and awareness raised about future regret if the unwanted behaviour is performed. Emotional consequences are monitored and the consequences of the unwanted behaviour are allowed to occur naturally and without interference.	35	61.4
6. Comparison of behaviour	An observable demonstration of the behaviour is provided. The performance of the behaviour is compared to other people's performance. Information about other people's approval of the unwanted behaviour is provided.	12	21.1
7. Associations	Environmental or social stimuli that prompt or cue the behaviour are introduced or removed, and access to any reward or aversive stimuli are removed. Stimuli that signal a reward are provided after the performance of the behaviour are identified. Repeated exposure to a stimulus that reduces the drive for the unwanted behaviour, and systematic exposure to a feared stimulus is conducted. Repeated exposure to a neutral stimulus along with a stimulus that elicits the behaviour is presented.	0	0.0
8. Repetition and substitution	The performance of the behaviour is practiced and/or rehearsed in different or similar contexts. The unwanted behaviour is substituted with an alternative behaviour, and rehearsal and repetition of this alternative behaviour is prompted. The wanted behaviour is repeated in an exaggerated fashion. Tasks are performed that gradually increase in	30	52.6

(continued on next page)

Table 1 (*continued*)

BCT group label	BCT group definition	n	%
	difficult until the behaviour is performed.		
9. Comparison of outcomes	Information from a credible source is presented that is either in favour or against the behaviour. The pros and cons of changing the unwanted behaviour are identified. Different future outcomes are imagined and compared based on whether the behaviour is changed or remains unchanged.	5	8.8
10. Reward and threat	Material, social or non-specific incentives or rewards are provided depending on whether the behaviour is performed or behavioural outcomes are successful. Self-incentive or self-reward is arranged or provided. If the unwanted behaviour is performed, future punishment or reward removal is arranged.	18	31.6
11. Regulation	Pharmacological support, advice on how to reduce negative emotions, advice on how to minimise demands on mental resources and paradoxical instructions are provided to help facilitate behaviour change.	13	22.8
12. Antecedents	The physical or social environment is altered. Objects are added to the environment. Routines are changed or distraction is employed to avoid cue exposure. The body structure, functioning or support is altered to facilitate behaviour change.	3	5.3
13. Identity	One's own behaviour may be used as an example to others. A new perspective about the behaviour is adopted. Discrepancies between the behaviour and self-image are identified, and a new self-image based on changing the unwanted behaviour is constructed. Personal strengths and values are explored.	9	15.8
14. Scheduled consequences	If the unwanted behaviour is performed, rewards are removed and adverse consequences are arranged. If the wanted behaviour is performed, rewards are provided (i.e., gradually, situation-specific) and adverse consequences are removed.	14	24.6
15. Self-belief	Positive self-talk is prompted, and verbal persuasion is used to argue against self-doubts about performing the wanted behaviour. Successful performance of the behaviour is imagined, and focusing on past times the behaviour was performed successfully is encouraged.	0	0.0
16. Covert learning	Performing the unwanted and wanted behaviour, followed by unpleasant and pleasant consequences, is imagined, respectively. The consequences experienced by others when they perform the behaviour is observed.	0	0.0
17 Restoring a balanced lifestyle*	Restoring a balanced lifestyle via self-care and arranging pleasant activities is advised.	10	17.5
18 Referral to additional help-seeking*	Information, advise or direct referrals to help-seeking outside of what is offered in the study's intervention is provided.	14	24.6
19 Confrontation of the addicted person to engage in treatment*	Confrontation or attempts to engage the addicted person into treatment is conducted.	30	52.6
20. Safety training*	Strategies on how to deal with dangerous situations, such as family violence, are provided.	18	31.6
21. Communication training*	Strategies on how to improve communication, including assertiveness training, are provided.	29	50.9
22. Financial management*	Strategies on how to manage ones finances are provided.	6	10.5
23. 12-step approaches*	12-step approaches and traditions are discussed.	5	8.8

* Author-derived BCT groups. n = number of interventions that included a technique from the BCT group; % = percentage of interventions that included a technique from the BCT group (calculated based on 57 interventions across the 32 included studies).

were standardised mean change (d) with raw score standardisation, as described by Morris and DeShon (2002). Effect size estimates and sampling variances were calculated using the *escalc()* function, which was specified to produce the 'SMCR' index. The calculation utilises data regarding the sample size, means and standard deviations at pre- and post-intervention, and the correlation between pre- and post-intervention measures. The latter, however, was not reported in any of the included studies, therefore a correlation of $r = 0.50$ was assumed. Sensitivity analyses were then conducted with correlation values of $r = 0.10$ and 0.90, with no differences in the findings identified. Means and standard deviations were derived from t-statistics, cohen's d, standard errors, and 95% confidence intervals, when means and standard deviations were not directly reported.

Random effects analyses, with restricted maximum-likelihood (REML) estimation, using the *rma()* function were conducted. These meta-analytic models were first conducted on each FCF, addicted person and relationship functioning outcome in order to provide an estimate of within-group change across all of the interventions. Heterogeneity was evaluated using the I^2 statistic, which indicates the proportion of observed variance not attributable to sampling error (0–40% = minor; 30–60% = moderate; 50–90% = substantial; 75–100% = considerable; (Higgins & Thompson, 2002).

To determine whether the use of each BCT group was associated with differential effectiveness, a series of mixed-effect meta-regressions, which were conditional on group level BCTs, were then conducted. BCT groups were dummy-coded, which produced estimates of repeated measures effect sizes with 95% confidence intervals (CIs) for each level of the moderator (i.e., studies with and without the inclusion of the BCT group). These models also produced the QM statistic, which provided a significance test of the null hypotheses. In addition, to examine the impact of various methodological characteristics on these effects, a series of mixed-effect meta-regressions that included the interaction between each group level BCT and addiction type (alcohol, drug, gambling), mode of intervention delivery (therapist-delivered, self-directed) and intervention duration (brief, long) were conducted.

These univariate random-effects models and mixed-effect meta-regressions were repeated with the effect size of interest being the standardised mean difference (continuous outcomes) and risk ratios (categorical outcomes) between the intervention and control group, at a post-intervention time-point. Similar to above, effect size estimates and sampling variances were calculated using the *escalc()* function, but were specified to produce the 'SMD' index for continuous outcomes and 'RR' index for categorical outcomes (addicted person treatment entry). Consistent with previous reviews (Merkouris et al., 2021), only RCTs that utilised a passive control group (i.e., no intervention, waitlist control, assessment only, treatment referral, or non-specific treatment component controls), were eligible for these analyses. A minimum of 3 estimates were required for all of the random effects model analyses to be conducted (within- and between-group analyses), with 3 estimates

per moderator level required for any of the mixed-effect meta-regressions.

2.5. Differences between the registered protocol and review

Differences between PROSPERO and the current review include: (1) the search strategy was updated to include the EMBASE database, search for RCTs only and to include articles published until August 2021; these changes were based on changes to the search strategy of Merkouris et al. (2021), on which this search is based; and (2) sensitivity analyses adjusting the assumed correlation value were conducted to ensure that the findings remained robust to this analytic change; this change was made given the correlation between pre-intervention and post-intervention measures required for the within-group analyses was not available.

3. Results

3.1. Search results

After the removal of duplicates, 6682 articles were identified for title and abstract screening. Of these, 6526 articles were excluded as they clearly did not evaluate the effectiveness of an intervention delivered to individuals primarily affected by someone else's alcohol use, substance use, gambling or gaming. The remaining 156 articles were assessed for eligibility at the full text stage, with 118 of these excluded for various reasons, such as the use of adolescent samples (k = 47) and the intervention target being the addicted person (k = 44). The remaining 38 articles, which were based on 32 study samples, were included in this systematic review *Ager, Yoshioka and Adams, 2020; *Barber and Crisp, 1995; *Barber and Gilbertson, 1996; *Barber and Gilbertson, 1998; *Bischof, Iwen, Freyer-Adam and Rumpf, 2016; *Copello et al., 2009; *Dittrich and Trapold, 1984; *Eék et al., 2020; *Gustafson, McTavish, Schubert and Johnson, 2012; *Halford, Price, Kelly, Bouma and Young, 2001; *Hansson, Rundberg, Zetterlind, Johnsson and Berglund, 2006; *Hansson, Rundberg, Zetterlind, Johnsson and Berglund, 2007; *Hansson, Zetterlind, Åberg-Örbeck and Berglund, 2004; *Hodgins, Toneatto, Makarchuk, Skinner and Vincent, 2007; *Hojjat, Rezaei, Hatami, Kohestani and Norozi Khalili, 2017; *Howells and Orford, 2006; *Karimi, Rezaee, Shakiba and Navidian, 2019; *Kirby et al., 2017; *Kirby, Marlowe, Festinger, Garvey and LaMonaca, 1999; *Liepman, Nirenberg and Begin, 1989; *de los Angeles Cruz-Almanza, Gaona-Márquez and Sánchez-Sosa, 2006; *Magnusson, Nilsson, Andersson, Hellner and Carlbring, 2019; *Makarchuk, Hodgins and Peden, 2002; *Manuel et al., 2012; *Meyers, Miller, Smith and Tonigan, 2002; *Miller, Meyers and Tonigan, 1999; *Nayoski and Hodgins, 2016; *Osilla, Rodriguez, Neighbors and Pedersen, 2022; *Osilla et al., 2018; *Osterndorf, Enright, Holter and Klatt, 2011; *Rodriguez, Osilla, Trail, Gore and Pedersen, 2018; *Rychtarik and McGillicuddy, 2005; *Rychtarik and McGillicuddy, 2006; *Rychtarik, McGillicuddy and Barrick, 2015; *Trail, Osilla, Rodriguez, Pedersen and Gore, 2019; *Velleman et al., 2011; *Zetterlind, Berglund and Aberg-Orbeck, 1996; *Zetterlind, Hansson, Aberg-Orbeck and Berglund, 2001). See Fig. 1 for the PRISMA flow diagram of these search results. In addition, 2 protocol papers, which were identified by the systematic search but did not meet eligibility criteria, were used to assist with the coding of the BCTs (Magnusson, Nilsson, Gumpert, Andersson, & Carlbring, 2015; Osilla, Pedersen, Gore, Trail, & Howard, 2014).

3.2. Characteristics of included studies

Of the 32 included studies, the majority (62.5%; k = 20) evaluated

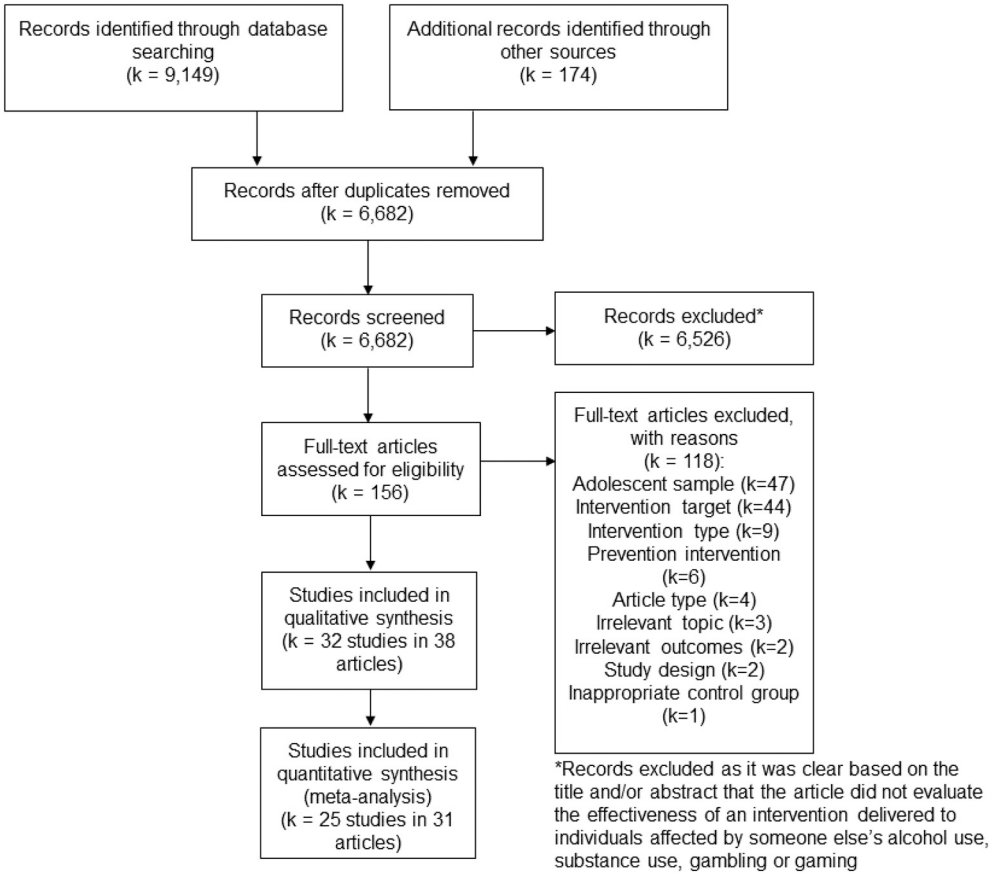

Fig. 1. PRISMA flow diagram.

interventions for individuals affected by alcohol use, followed by gambling (15.6%; k = 5), illicit drug use (12.5%; k = 4) and a combination of alcohol and illicit drug use (9.4%; k = 3). None of the included studies evaluated an intervention for individuals affected by someone else's gaming use. Most studies were conducted in the USA (43.8%; k = 14), followed by Sweden (15.6%; k = 5) and Australia (12.5%; k = 4). The sample sizes ranged from 12 to 312 participants (M = 80.1, SD = 74.8, Median = 52.5). The target of the interventions varied, with the majority of studies evaluating interventions that broadly targeted any family member, friend or caregiver affected by someone else's addiction (35.7%; k = 15), followed by interventions that specifically targeted spouses or partners only (43.8%; k = 14) and adult children (9.4%; k = 3). Studies evaluated a range of therapist-delivered interventions (individually-delivered: 46.9%, k = 15; group-delivered: 43.8%, k = 14), with a much smaller number evaluating self-directed interventions (21.9%; k = 7). In addition, 21.9% (k = 7) of studies evaluated single intervention arms that used a combination of individually-delivered, group-delivered and/or self-directed modalities (note that the percentages do not sum to 100% as some studies included multiple interventions with different modes of delivery). The characteristics of included studies are presented in Appendix C.

3.3. Frequency of the BCTs

Across the 32 included studies, 57 interventions were identified and examined for the presence of BCTs. BCTs that were not in the original Michie et al. (2013) taxonomy were identified to ensure all active components of affected other interventions were included. During the coding process, seven additional BCT groups were derived by the authors (restoring a balanced lifestyle; referral to additional help-seeking; confrontation of the addicted person to engage in treatment, safety training; communication training; financial management; 12-step approaches). A summary of the frequency of all BCT groups have been presented in Table 1, along with descriptions of each of these BCT groups. Of the total 23 BCT groups, 20 were identified in at least one intervention description, with associations, self-belief and covert learning not identified in any of the 57 interventions. The majority of interventions employed a BCT within the shaping knowledge group (n = 48; 84.2%), followed closely by BCTS within natural consequences (n = 35, 61.4%), goals and planning (n = 30, 52.6%), repetition and substitution (n = 30, 52.6%), and confrontation of the addicted person to engage in treatment (n = 30, 52.6%).

3.4. Effectiveness of BCTs

3.4.1. Within-group change

Of the 32 included studies, 25 provided sufficient data for inclusion in the meta-analysis. Presented in Table 2 are the results of the random-effects meta-analyses estimating the mean change from pre-intervention to post-intervention across all of the interventions for each of the eight relevant outcomes (six FCF; one addicted person; and one relationship functioning). These findings indicate that there were significant reductions in FCF depression, anxiety, and psychological distress, as well as addicted person frequency of use and marital discord, from pre-intervention to the first post-intervention time-point. In addition, there was significant improvements in life satisfaction and coping from pre-intervention to the first post-intervention time-point. The estimates of mean change were quite similar across all outcomes, ranging from −0.49 to 0.71, with coping (d = 0.71), marital discord (d = −0.48) and life satisfaction (d = 0.47) displaying the largest mean changes.

3.4.1.1. FCF outcomes. Tables 3-8 display the results from the series of mixed-effects analyses of mean change across the six FCF outcomes, in which each BCT group was specified as a moderator variable.

3.4.1.1.1. Depression. Analyses for 16 of the 23 BCT groups could be conducted for FCF depression as a minimum of three estimates were available per group (i.e., included the BCT and did not include the BCT). The test of moderators indicated that interventions that did not include *Reward and Threat* and *Scheduled Consequences* were associated with greater reductions in depression than interventions that did include these BCT groups.

3.4.1.1.2. Psychological distress. Analyses for 14 of the 23 BCT groups could be conducted for FCF psychological distress. The test of moderators indicated that interventions that included a BCT relating to *Restoring a balanced lifestyle* were associated with greater reductions in psychological distress, compared to interventions that did not include this BCT group.

3.4.1.1.3. Anxiety. Analyses for ten of the 23 BCT groups could be conducted for FCF anxiety. The test of moderators indicated that interventions that did not include *Reward and threat*, *Scheduled consequences* and *Confrontation of the addicted person to engage in treatment* were associated with significant reductions in anxiety, compared to interventions that did include these BCTs, which showed no significant change.

3.4.1.1.4. Addiction-related harms. Analyses for seven of the BCT groups could be conducted for FCF addiction-related harms. The test of moderators indicated that interventions that did not include *Goals and planning* were associated with significant reductions in addiction-related harms, compared to interventions with goals and planning, which showed no change. In addition, interventions that included *Reward and threat* and *Scheduled consequences* were associated with significant reductions in addiction-related harms, compared to interventions that did not include these BCT groups, which showed no change.

3.4.1.1.5. Coping and life satisfaction. Analyses for ten of the 23 BCT groups could be conducted for FCF coping, and analyses for five of the BCT groups could be conducted for FCF life satisfaction. The test of moderators indicated that none of these BCT groups were significant moderators of change for FCF coping or life satisfaction.

3.4.1.2. Addicted person outcomes. Table 9 displays the results from the series of mixed-effects analyses of mean change for the one addicted person outcome, in which each BCT group was specified as a moderator variable.

3.4.1.2.1. Frequency of use. Analyses for 14 of the 23 BCT groups could be conducted for addicted person frequency of use. The test of moderators indicated that interventions that included a BCT relating to *Repetition and substitution*, *Reward and threat*, *Scheduled consequences* and *Restoring a balanced lifestyle* were associated with greater reductions in

Table 2
Random effects meta-analyses of standardised mean change (i.e., within-group change) across all affected other, addicted person and relationship functioning outcomes.

Outcome	k	d	95% Lower CI	95% Upper CI	p	I^2
Affected other						
Depression	21	−0.42	−0.50	−0.33	<0.0001	3.87%
Psychological distress	20	−0.37	−0.46	−0.29	<0.0001	0.02%
Anxiety	11	−0.22	−0.38	−0.06	0.007	27.60%
Coping	11	0.71	0.28	1.14	0.001	89.31%
Life satisfaction	9	0.47	0.23	0.70	<0.001	53.94%
Addiction-related harms	7	−0.34	−0.69	0.02	0.061	85.44%
Addicted person						
Frequency of use	16	−0.38	−0.50	−0.25	<0.0001	45.99%
Relationship functioning						
Marital discord	20	−0.49	−0.64	−0.33	<0.001	63.13%

k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 3
Results from mixed-effects meta-analyses of affected other depression examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M *p*-value
(1) Goals and planning	13	−0.45	−0.56	−0.33	8	−0.37	−0.52	−0.23	0.518
(2) Feedback and monitoring	9	−0.39	−0.51	−0.26	12	−0.45	−0.56	−0.33	0.436
(3) Social support	7	−0.34	−0.48	−0.20	14	−0.45	−0.55	−0.36	0.195
(4) Shaping knowledge	18	−0.42	−0.51	−0.33	3	−0.38	−0.66	−0.10	0.826
(5) Natural consequences	14	−0.40	−0.50	−0.30	7	−0.47	−0.65	−0.30	0.449
(6) Comparison of behaviour	8	−0.37	−0.50	−0.25	13	−0.46	−0.57	−0.34	0.292
(8) Repetition and substitution	11	−0.37	−0.47	−0.27	10	−0.48	−0.62	−0.35	0.190
(9) Comparison of outcomes	4	−0.42	−0.62	−0.22	17	−0.42	−0.51	−0.32	0.949
(10) Reward and threat	8	−0.32	−0.43	−0.21	13	−0.51	−0.63	−0.39	**0.020**
(11) Regulation	3	−0.47	−0.68	−0.25	18	−0.41	−0.50	−0.31	0.621
(14) Scheduled consequences	11	−0.33	−0.44	−0.23	10	−0.55	−0.68	−0.41	**0.014**
(17) Restoring a balanced lifestyle	3	−0.32	−0.45	−0.18	18	−0.46	−0.57	−0.36	0.092
(18) Referral to additional help-seeking	4	−0.43	−0.79	−0.06	17	−0.42	−0.50	−0.33	0.954
(19) Confrontation of the addicted person to engage in treatment	10	−0.37	−0.50	−0.24	11	−0.47	−0.61	−0.34	0.330
(20) Safety training	5	−0.31	−0.51	−0.10	16	−0.44	−0.54	−0.35	0.259
(21) Communication training	10	−0.35	−0.46	−0.25	11	−0.50	−0.64	−0.37	0.074

Bold indicates significance at $p < 0.05$. k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 4
Results from mixed-effects meta-analyses of affected other psychological distress examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
(1) Goals and planning	9	−0.42	−0.54	−0.29	11	−0.33	−0.44	−0.21	0.305
(2) Feedback and monitoring	8	−0.35	−0.49	−0.21	12	−0.38	−0.49	−0.28	0.705
(3) Social support	3	−0.30	−0.48	−0.13	17	−0.39	−0.49	−0.29	0.393
(5) Natural consequences	11	−0.40	−0.54	−0.26	9	−0.35	−0.46	−0.23	0.536
(8) Repetition and substitution	13	−0.41	−0.53	−0.29	7	−0.32	−0.45	−0.20	0.324
(10) Reward and threat	4	−0.47	−0.66	−0.27	16	−0.35	−0.44	−0.25	0.287
(11) Regulation	8	−0.32	−0.45	−0.18	12	−0.41	−0.51	−0.30	0.310
(13) Identity	4	−0.32	−0.66	0.03	16	−0.39	−0.48	−0.29	0.401
(17) Restoring a balanced lifestyle	4	−0.62	−0.91	−0.34	16	−0.34	−0.43	−0.24	**0.047**
(18) Referral to additional help-seeking	5	−0.48	−0.67	−0.29	15	−0.34	−0.44	−0.25	0.216
(19) Confrontation of the addicted person to engage in treatment	7	−0.44	−0.58	−0.30	13	−0.33	−0.43	−0.22	0.203
(20) Safety training	6	−0.45	−0.63	−0.27	14	−0.35	−0.44	−0.25	0.353
(21) Communication training	11	−0.37	−0.48	−0.25	9	−0.37	−0.50	−0.24	0.959
(22) Financial management	3	−0.41	−0.62	−0.19	17	−0.36	−0.46	−0.27	0.720

Bold indicates significance at $p < 0.05$. k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 5
Results from mixed-effects meta-analyses of affected other anxiety examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
(1) Goals and planning	6	−0.25	−0.45	−0.05	5	−0.17	−0.48	0.14	0.646
(2) Feedback and monitoring	6	−0.25	−0.43	−0.06	5	−0.17	−0.52	0.17	0.612
(3) Social support	5	−0.14	−0.43	0.14	6	−0.30	−0.55	−0.05	0.395
(5) Natural consequences	8	−0.21	−0.41	0.00	3	−0.31	−0.73	0.10	0.649
(6) Comparison of behaviour	4	−0.27	−0.41	−0.13	7	−0.24	−0.60	0.11	0.213
(8) Repetition and substitution	4	−0.17	−0.33	−0.02	7	−0.35	−0.71	0.01	0.346
(10) Reward and threat	4	−0.10	−0.30	0.09	7	−0.42	−0.64	−0.20	**0.049**
(14) Scheduled consequences	4	−0.10	−0.30	0.09	7	−0.42	−0.64	−0.20	**0.049**
(19) Confrontation of the addicted person to engage in treatment	3	0.02	−0.20	0.23	8	−0.33	−0.48	−0.17	**0.011**
(21) Communication training	6	−0.18	−0.34	−0.01	5	−0.49	−0.99	0.01	0.196

Bold indicates significance at $p < 0.05$. k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 6
Results from mixed-effects meta-analyses of affected other coping examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
(1) Goals and planning	6	0.89	0.63	1.15	5	0.48	−0.54	1.49	0.297
(5) Natural consequences	6	0.54	−0.14	1.22	5	0.89	0.32	1.46	0.432
(6) Comparison of behaviour	4	1.11	0.51	1.71	7	0.47	−0.07	1.02	0.138
(8) Repetition and substitution	8	0.68	0.04	1.32	3	0.81	0.60	1.01	0.816
(11) Regulation	5	0.69	0.47	0.90	6	0.73	−0.15	1.60	0.972
(12) Antecedents	3	1.09	0.19	2.00	8	0.59	0.07	1.10	0.338
(13) Identity	3	0.53	0.29	0.78	8	0.79	0.16	1.42	0.614
(18) Referral to additional help-seeking	3	0.33	−1.22	1.88	8	0.80	0.48	1.11	0.345
(20) Safety training	3	0.33	−1.22	1.88	8	0.80	0.48	1.11	0.345
(21) Communication training	7	0.82	0.55	1.10	4	0.33	−0.75	1.41	0.240

k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 7
Results from mixed-effects meta-analyses of affected other life satisfaction examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
(2) Feedback and monitoring	5	0.52	0.29	0.74	4	0.46	0.00	0.92	0.987
(3) Social support	4	0.33	0.05	0.61	5	0.55	0.18	0.93	0.370
(8) Repetition and substitution	6	0.37	0.13	0.61	3	0.63	0.11	1.15	0.245
(10) Reward and threat	6	0.38	0.14	0.62	3	0.60	0.06	1.15	0.307
(21) Communication training	4	0.40	0.07	0.72	5	0.52	0.16	0.87	0.614

k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 8
Results from mixed-effects meta-analyses of affected other addiction-related harms examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
(1) Goals and planning	3	−0.10	−0.88	0.69	4	−0.49	−0.67	−0.31	**0.036**
(2) Feedback and monitoring	4	−0.23	−0.84	0.38	3	−0.45	−0.67	−0.22	0.904
(6) Comparison of behaviour	3	−0.56	−0.89	−0.23	4	−0.15	−0.70	0.39	0.061
(8) Repetition and substitution	3	−0.56	−0.89	−0.23	4	−0.15	−0.70	0.39	0.921
(10) Reward and threat	3	−0.53	−0.83	−0.23	4	−0.17	−0.74	0.40	**0.036**
(14) Scheduled consequences	3	−0.53	−0.83	−0.23	4	−0.17	−0.74	0.40	**0.036**
(21) Communication training	4	−0.55	−0.77	−0.33	3	0	−0.67	0.66	0.921

Bold indicates significance at $p < 0.05$. k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 9
Results from mixed-effects meta-analyses of addicted person frequency of use examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
(1) Goals and planning	7	−0.39	−0.61	−0.18	9	−0.36	−0.51	−0.21	0.715
(2) Feedback and monitoring	5	−0.45	−0.70	−0.21	11	−0.32	−0.46	−0.19	0.308
(5) Natural consequences	10	−0.36	−0.53	−0.18	6	−0.39	−0.56	−0.21	0.825
(6) Comparison of behaviour	5	−0.43	−0.66	−0.21	11	−0.34	−0.49	−0.19	0.469
(8) Repetition and substitution	10	−0.51	−0.65	−0.37	6	−0.20	−0.34	−0.05	**0.001**
(10) Reward and threat	5	−0.61	−0.75	−0.47	11	−0.27	−0.38	−0.16	**<0.001**
(11) Regulation	4	−0.27	−0.49	−0.05	12	−0.40	−0.55	−0.25	0.448
(14) Scheduled consequences	3	−0.67	−0.81	−0.52	13	−0.26	−0.37	−0.15	**<0.001**
(17) Restoring a balanced lifestyle	4	−0.60	−0.75	−0.45	12	−0.30	−0.44	−0.17	**0.019**
(18) Referral to additional help-seeking	4	−0.35	−0.54	−0.17	12	−0.38	−0.54	−0.21	0.922
(19) Confrontation of the addicted person to engage in treatment	8	−0.47	−0.65	−0.29	8	−0.31	−0.48	−0.13	0.212
(20) Safety training	6	−0.40	−0.58	−0.23	10	−0.36	−0.53	−0.18	0.799
(21) Communication training	9	−0.45	−0.63	−0.27	7	−0.26	−0.40	−0.13	0.122
(22) Financial management	3	−0.39	−0.68	−0.09	13	−0.38	−0.52	−0.23	0.979

Bold indicates significance at $p < 0.05$. k = number of studies; d = standardised mean change; CI = Confidence Interval.

addicted person frequency of use, compared to interventions that did not include these BCT groups.

3.4.1.3. Relationship functioning outcomes. Table 10 displays the results from the series of mixed-effects analyses of mean change for the one relationship functioning outcome, in which each behaviour change group was specified as a moderator variable.

3.4.1.3.1. Marital discord. Analyses for 16 of the BCT groups could be conducted for marital discord. The test of moderators indicated that interventions that included *Confrontation of the addicted person to engage in treatment* were associated with significant reductions in marital discord, compared to interventions that did not include this BCT group, which displayed no significant change.

3.4.1.4. Interaction between BCT groups and methodological characteristics. Table 11 presents the results of the mixed-effects regressions exploring the interaction between each BCT group and various methodological characteristics (addiction type, mode of intervention delivery and intervention duration). There were an insufficient number of estimates to conduct these analyses for the interactions between any BCT group and addiction type and intervention duration. Of the analyses that could be conducted for mode of intervention delivery, only the interaction between social support and mode of intervention delivery on marital discord was significant ($p = 0.005$). Further inspection of these results indicated that therapist-delivered interventions that included social support BCTs showed a significant reduction in marital discord (d = −0.79; 95% CI -1.15, −0.43) compared to self-directed interventions that included social support, which showed no reduction over time (d = −0.28; 95% CI -0.61, 0.06).

Table 11
Results from mixed-effects meta-analyses examining the interaction between behaviour change techniques and mode of intervention delivery based on standardised mean change (i.e., within-group change).

	k	d	Lower 95% CI	Upper 95% CI	p
Affected other depression					
(8) Repetition and substitution	21	−0.14	−0.49	0.22	0.443
(10) Reward and threat	21	−0.13	−0.49	0.24	0.499
(14) Scheduled consequences	21	−0.08	−0.46	0.30	0.683
(19) Confrontation of the addicted person to engage in treatment	21	0.17	−0.18	0.52	0.344
(21) Communication training	21	−0.12	−0.58	0.34	0.610
Affected other psychological distress					
(1) Goals and planning	20	−0.21	−0.56	0.14	0.244
(5) Natural consequences	20	−0.13	−0.48	0.22	0.468
(8) Repetition and substitution	20	0.12	−0.23	0.47	0.508
(11) Regulation	20	0.17	−0.18	0.53	0.341
(19) Confrontation of the addicted person to engage in treatment	20	0.05	−0.32	0.41	0.798
(20) Safety training	20	−0.15	−0.60	0.30	0.516
Addicted person frequency of use					
(20) Safety training	16	−0.31	−0.84	0.21	0.242
Marital discord					
(3) Social support	20	−0.88	−1.49	−0.26	**0.005**
(5) Natural consequences	20	−0.36	−1.05	0.32	0.295
(10) Reward and threat	20	−0.46	−1.11	0.19	0.168
(14) Scheduled consequences	20	−0.57	−1.21	0.07	0.081
(20) Safety training	20	0.44	−0.28	1.16	0.233

Bold indicates significance at $p < 0.05$. k = number of studies; d = standardised mean change; CI = Confidence Interval.

3.4.2. Between-group change

Table 12 presents the results of the random-effects meta-analyses estimating the standardised mean difference between interventions and control groups at a post-intervention time-point across all nine outcomes (six FCF; two addicted person and one relationship functioning). These findings indicated that when compared to control groups, psychosocial interventions demonstrated significant improvements in FCF depression, anxiety, coping and life satisfaction, but not addiction-related harms or psychological distress. These findings also indicated that when compared to control groups, psychosocial interventions demonstrated significant improvements in addicted person frequency of use, treatment entry and marital discord. The estimates of standardised mean difference varied across the outcomes, ranging from −1.22 to 0.66, with affected other coping (d = −1.22) and addicted person treatment entry (d = 0.66) displaying the largest effect sizes.

Table 13 displays the results from the series of mixed effects analyses of standardised mean difference across all outcomes, in which each BCT group was specified as a moderator variable. There were an insufficient number of estimates to conduct any analyses on FCF psychological distress, anxiety, coping and addiction-related harms. Of the few outcomes for which the test of moderators that could be conducted, the results indicate that none of the BCT groups were significant moderators

Table 10
Results from mixed-effects meta-analyses of marital discord examining variability across behaviour change techniques based on standardised mean change (i.e., within-group change).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
(1) Goals and planning	12	−0.58	−0.79	−0.36	8	−0.38	−0.61	−0.15	0.226
(2) Feedback and monitoring	6	−0.41	−0.70	−0.11	14	−0.52	−0.70	−0.33	0.536
(3) Social support	7	−0.58	−0.93	−0.23	13	−0.46	−0.63	−0.29	0.602
(5) Natural consequences	13	−0.43	−0.65	−0.22	7	−0.60	−0.78	−0.41	0.283
(6) Comparison of behaviour	4	−0.24	−0.50	0.02	16	−0.54	−0.71	−0.37	0.154
(8) Repetition and substitution	13	−0.52	−0.69	−0.34	7	−0.44	−0.78	−0.10	0.533
(10) Reward and threat	10	−0.44	−0.65	−0.23	10	−0.53	−0.77	−0.29	0.597
(11) Regulation	4	−0.53	−0.96	−0.11	16	−0.47	−0.64	−0.30	0.807
(14) Scheduled consequences	11	−0.46	−0.65	−0.27	9	−0.51	−0.78	−0.23	0.856
(17) Restoring a balanced lifestyle	5	−0.36	−0.65	−0.07	15	−0.54	−0.73	−0.36	0.293
(18) Referral to additional help-seeking	4	−0.74	−0.97	−0.51	16	−0.44	−0.61	−0.27	0.166
(19) Confrontation of the addicted person to engage in treatment	15	−0.58	−0.70	−0.45	5	−0.28	−0.71	0.15	**0.016**
(20) Safety training	6	−0.61	−0.8	−0.38	14	−0.44	−0.64	−0.25	0.329
(21) Communication training	9	−0.54	−0.76	−0.32	11	−0.44	−0.67	−0.27	0.510
(22) Financial management	3	−0.77	−1.00	−0.53	17	−0.44	−0.60	−0.27	0.124

Bold indicates significance at $p < 0.05$. k = number of studies; d = standardised mean change; CI = Confidence Interval.

Table 12
Random effects meta-analyses of standardised mean difference (i.e., between-group estimates) across all affected other, addicted person and relationship functioning outcomes.

Outcome	k	d	Lower 95% CI	Upper 95% CI	p	I^2
Affected other outcomes						
Depression	8	−0.44	−0.65	−0.23	<0.0001	36.03%
Life satisfaction	6	−0.44	−0.74	−0.14	0.005	36.06%
Psychological distress	6	−0.21	−0.44	0.03	0.082	37.99%
Anxiety	4	−0.22	−0.41	−0.03	0.027	0.01%
Addiction-related harms	4	−0.36	−0.89	0.18	0.194	76.28%
Coping	3	−1.22	−1.83	−0.60	<0.0001	72.92%
Addicted person outcomes						
Addicted person treatment entry*	9	0.66	0.23	1.09	0.003	0.00%
Addicted person frequency of use	7	−0.24	−0.43	−0.04	0.016	25.56%
Relationship functioning outcomes						
Marital discord	9	−0.39	−0.66	−0.13	0.003	54.34%

k = number of studies; d = standardised mean difference; CI = Confidence Interval.
* Risk ratio was used for this meta-analysis as the outcome was categorical.

of change for FCF depression, FCF life satisfaction, FCF psychological distress, addicted person frequency of use, addicted person treatment entry nor marital discord.

3.5. Risk of bias

As displayed in Appendix D, over half of the included studies were classified overall as having some concerns for bias (53.1%; k = 17), followed by a high risk of bias (46.9%; k = 15). When broken down by domain, over half of the studies (53.1%; k = 17) were classified as having some concerns for bias arising from the randomisation process, followed by high (25.0%; k = 8) and low (21.9%; k = 7) risk of bias classifications. Most studies were classified as having some concerns (46.9%; k = 15) for bias arising from deviations from the intended intervention, followed by high (28.1%; k = 9) and low (25.0%; k = 8) risk of bias classifications. Most studies were classified as having low risk of bias (78.1%; k = 25) arising from missing outcome data, followed by high risk of bias (12.5%; k = 4) and some concerns (9.4%; k = 3). Half of the studies were also classified as having some concerns (50.0%; k = 16) for bias arising from measurement of the outcome, followed by low (40.6%; k = 13) and high (9.4%; k = 3) risk of bias classifications. Finally, most studies were classified as having some concerns (78.1%; k = 25) for bias arising due to selection of reported results, followed by low (18.8%; k = 6) and high (3.1%; k = 1) risk of bias classifications.

Table 13
Results from mixed effects meta-analyses examining variability across behaviour change techniques across all outcomes based on standardised mean difference (i.e., between-group differences).

	BCT included				BCT not included				Test of moderators
BCT	k	d	Lower 95% CI	Upper 95% CI	k	d	Lower 95% CI	Upper 95% CI	Q_M p-value
Affected other depression									
(5) Natural consequences	5	−0.40	−0.67	−0.13	3	−0.56	−0.95	−0.17	0.477
(6) Comparison of behaviour	5	−0.49	−0.81	0.16	3	−0.41	−0.69	−0.12	0.897
(10) Reward and threat	4	−0.27	−0.48	−0.05	4	−0.61	−0.90	−0.32	0.069
(14) Scheduled consequences	5	−0.33	−0.57	−0.09	3	−0.58	−0.90	−0.26	0.214
(19) Confrontation of the addicted person to engage in treatment	4	−0.45	−0.73	−0.17	4	−0.44	−0.77	0.11	0.775
Life satisfaction									
(2) Feedback and monitoring	3	−0.44	−0.79	−0.10	3	−0.46	−0.97	0.04	0.821
(21) Communication training	3	−0.36	−0.72	0.01	3	−0.50	−1.04	0.03	0.586
*Addicted person treatment entry**									
(2) Feedback and monitoring	5	0.42	−0.15	1.00	4	0.97	0.32	1.62	0.217
(3) Social support	3	0.97	−0.50	2.43	6	0.65	0.18	1.11	0.843
(10) Reward and threat	6	0.59	0.09	1.08	3	0.90	0.03	1.77	0.544
(14) Scheduled consequences	4	0.93	0.24	1.62	4	0.46	−0.13	1.01	0.300
(21) Communication training	6	0.52	0.05	0.98	3	1.55	0.40	2.70	0.104
Addicted person frequency of use									
(5) Natural consequences	3	−0.20	−0.39	0.00	4	−0.34	−0.77	0.08	0.724
(6) Comparison of behaviour	4	−0.16	−0.40	0.08	3	−0.39	−0.72	−0.05	0.286
(19) Confrontation of the addicted person to engage in treatment	3	−0.39	−0.72	−0.05	4	−0.16	−0.40	0.08	0.286
Marital discord									
(2) Feedback and monitoring	4	−0.42	−0.86	0.02	5	−0.40	−0.75	−0.04	0.978
(3) Social support	4	−0.34	−0.75	0.06	5	−0.45	−0.82	−0.07	0.730
(5) Natural consequences	6	−0.41	−0.71	−0.11	3	−0.37	−0.98	0.25	0.769
(10) Reward and threat	5	−0.38	−0.71	−0.04	4	−0.43	−0.90	0.04	0.919
(14) Scheduled consequences	6	−0.38	−0.68	−0.08	3	−0.43	−1.03	0.17	0.991
(17) Restoring a balanced lifestyle	3	−0.33	−0.79	0.14	6	−0.46	−0.79	−0.12	0.589
(21) Communication training	5	−0.25	−0.57	0.07	4	−0.68	−1.02	−0.33	0.077

k = number of studies; d = standardised mean difference; CI = Confidence Interval.
* Risk ratio was used for this meta-analysis as the outcome was categorical.

4. Discussion

This is the first systematic review and meta-analysis to systematically apply an established BCT taxonomy to psychosocial interventions aimed at assisting FCFs impacted by addiction, and determine the effectiveness of these BCTs across these interventions.

4.1. Application of established BCT taxonomy

Using an established and general BCT taxonomy (Michie et al., 2013), BCTs from 13 of the 16 BCT groups were identified in the included interventions. For the purpose of the current study, seven additional BCT groups were identified that applied to this FCF intervention literature. These findings further support that established general BCT taxonomies can be applied to the addictions field (de Bruin et al., 2021; Humphreys et al., 2021), and are the first to support that such BCT taxonomies can also be applied to FCF populations. The addition of several new BCT groups, however, highlights the potential need for the development of new, or modification of existing, BCT taxonomies that can cater to intervention needs specific to FCFs.

The most commonly employed BCTs in the identified family member interventions across the addictions were categorised within the shaping knowledge, natural consequences, goals and planning, repetition and substitution, and confrontation of the addicted person to engage in treatment BCT groups. These findings are somewhat similar to a recent study that developed two taxonomies (family member- and gambler-focused) of BCTs for FCFs impacted by someone else's gambling based on self-help strategies identified in gambling forum data (Booth et al., 2021). Similar to the current study, Booth and colleagues (Booth et al., 2021) found that FCFs more commonly used self-help strategies that were categorised within the professional support for the gambler and planned consequences BCT groups, which reflect some of the content within the confrontation of the addicted person to engage in treatment and shaping knowledge BCT groups from the current study, respectively.

The findings of the current review also highlight potential gaps in the FCF intervention literature, in which BCTs from three groups (associations, self-belief, covert learning) may have been overlooked in intervention development. Future research should consider the utility and applicability of these BCT groups to interventions for FCFs.

4.2. Effectiveness of BCTs

4.2.1. FCF outcomes

The within-group analyses revealed that across all FCF outcomes, five of the BCT groups were significant moderators of pre-intervention to post-intervention change. Two BCT groups were significant across multiple FCF outcomes, including reward and threat and scheduled consequences. The findings for these BCT groups varied, with the exclusion of reward and threat and scheduled consequences displaying greater improvements compared to interventions with these BCT groups on FCF depression and anxiety; and the inclusion of these BCT groups displaying significant improvements in addiction-related harms, compared to interventions without these BCT groups, which showed no significant change.

Three BCT groups were significant moderators of a single FCF outcome. These BCT groups included goals and planning, restoring a balanced lifestyle and confrontation of the addicted person to engage in treatment. Of these BCT groups, interventions with restoring a balanced lifestyle were associated with greater improvements in FCF psychological distress, compared to interventions without this BCT group. In contrast, interventions without goals and planning and confrontation of the addicted person to engage in treatment showed greater improvements over time on FCF addiction-related harms and affected other anxiety, respectively, than interventions without these BCT groups.

Given this is the first study to review the effectiveness of BCTs for FCF-delivered interventions there is no prior research to compare the findings to, and as such further research is needed to clarify these mixed findings. Taken together, however, these findings suggest that BCTs that involve monitoring the addicted person's behaviour and providing rewards or punishment dependent on that behaviour does not improve the mental health of the FCF but may reduce other harms that they are experiencing due to the addicted person's behaviour.

4.2.2. Addicted person outcomes

The within-group analyses on addicted person outcomes (i.e., frequency of use) revealed that across the 14 BCT groups for which analyses could be run, four BCT groups were significant moderators of change from pre-intervention to post-intervention. These findings were consistent in demonstrating that while interventions with and without repetition and substitution, reward and threat, scheduled consequences and restoring a balanced lifestyle were associated with significant improvement over time, interventions with these BCT groups were associated with larger effect sizes. Taken together, these findings suggest that FCF-delivered interventions that aim to help the FCF support the addicted person (i.e., FCF-delivered interventions with an addicted person focus) may benefit from the inclusion of techniques from within these BCT groups. These BCT groups included behaviour substitution, behavioural practice/rehearsal and non-specific reward, so it may be beneficial to include these specific BCTs in FCF interventions. As the evidence base of FCF interventions across the addictions grows, future research is required to examine the effects of specific BCTs within these groups on intervention outcomes.

4.2.3. Relationship functioning outcomes

Across the 15 BCT groups with sufficient estimates for within-group analyses to be conducted, only confrontation of the addicted person to engage into treatment was a significant moderator of change in marital discord from pre-intervention to post-intervention. These findings suggest that interventions that included confrontation of the addicted person to engage into treatment were associated with significant improvements over time, whereas interventions without this BCT showed no change.

Of the limited analyses exploring the interaction between each BCT group and the various methodological characteristics that could be conducted across all FCF, addicted person and relationship functioning outcomes, only the interaction between social support and mode of intervention delivery on marital discord was significant. These findings revealed that therapist-delivered interventions that included BCTs within the social support group showed a reduction in marital discord, whereas self-directed interventions that included this BCT group showed no reduction over time. These findings suggest that there may be BCTs that are more effectively delivered in a face-to-face setting by a professional. Given, however, the very few interaction effects that could be explored, further research exploring such interaction effects is needed is needed as more research becomes available.

Taken together, these findings highlight that very few of the identified BCT groups differentially impacted on relationship functioning, suggesting that other active ingredients may be assisting in the reduction of marital discord between the FCF and addicted person. Further research is therefore required to develop and evaluate interventions for FCF that include other BCTs that may play a role in influencing relationship functioning outcomes, such as, shaping knowledge, associations or antecedents.

4.3. Strengths and limitations

This systematic review and meta-analysis employed replicable, reliable and robust methodology to identify and synthesise the available evidence relating to FCF-delivered interventions across the addictions. The risk of bias assessment revealed some strengths of this evidence base, with over three-quarters of the included studies dealing with missing data in an appropriate manner (e.g., intention-to-treat

analyses), and just under half of the included studies measuring the outcomes using appropriate tools.

Despite these strengths, the findings of the current review should be interpreted in light of several limitations. First, despite the inclusion of 32 studies in the current review, 25 of which provided sufficient data for inclusion in the meta-analysis, there were several meta-analyses that could not be conducted due to lack of variability in the BCT moderators (i.e., all or no interventions utilised a BCT group) or consisted of the minimum three estimates at the different levels of the moderator. The findings of the current meta-analyses need to be interpreted with caution due to the low number of estimates in some of these meta-analyses, with further research evaluating the effectiveness of FCF interventions needed. In particular, the between-group comparisons, in which no significant moderator effects were identified, need to be interpreted with caution as most of these analyses consisted of the minimum three estimates per subgroup required to conduct these analyses and hence may have lacked the requisite statistical power. This issue was further compounded by the variability in the outcomes evaluated, whereby studies measured a range of outcome variables, regardless of whether the intervention was FCF- or addicted person-focused. This suggests the need for the selection of outcome measures that appropriately evaluate the outcomes targeted by FCF-delivered interventions (Dowling, 2020). Relatedly, some of the estimates were the same for multiple BCT groups within an outcome. This indicates that the same studies were using the same BCT groups, suggesting caution in interpreting the findings as it is possible that not all moderators were having an effect on the outcome. As this research area advances, future meta-analyses could consider the use of analytic techniques that explore the efficacy of a combination of BCT groups on FCF outcomes (e.g., Sheeran et al., 2019).

Second, due to the limited number of available studies, the current review was limited in its ability to distinguish between BCTs that were directed at the FCF or the addicted person. For example, there were instances where monitoring and feedback related to the addicted person's behaviour and other instances where it related to the FCF's responses and coping mechanisms to said addictive behaviour. As this field advances, future meta-analyses should consider separating the BCTs into FCF or the addicted person focused techniques (Booth et al., 2021).

Finally, this review was limited in its ability to code the BCTs within the included interventions due to the lack of detail reported in published studies. There was substantial variability in the level of intervention detail provided in the included studies, ranging from very brief descriptions of the interventions to detailed descriptions. Moreover, while several studies provided descriptions of each intervention module or session delivered, these descriptions were brief and could only be used to classify interventions within a BCT group rather than to an individual BCT. Hence the current findings need to be interpreted with caution as it may be that certain BCTs were included in the interventions, but could not be classified due to insufficient reporting. Future RCTs need to provide greater detail on the interventions delivered to ensure that they are meeting at least the minimum reporting standards (e.g., CONSORT; Schulz, Altman, & Moher, 2011).

4.4. Implications for research translation

Notwithstanding the above limitations, the current review provides important insights into the active intervention components that can be effective in improving FCF, addicted person and relationship functioning outcomes. Despite variability in the findings, the current review highlights the need for different interventions that can target the various needs of affected others. Specifically, this review highlighted that while interventions that utilise operant conditioning principles (i.e., punishment and reward) may be effective in improving addicted person outcomes (i.e., frequency of use), these types of BCTs are not effective in improving most FCF outcomes (i.e., depression and anxiety) and have no impact on relationship functioning outcomes (i.e., marital discord). Similarly, this review highlighted that interventions which utilise some kind of confrontation of the addicted person urging them to seek treatment may be effective in improving relationship functioning outcomes (i.e., marital discord), but are not effective in improving FCF outcomes (i.e., anxiety) and have no impact on addicted person outcomes (i.e., frequency of use or treatment entry). Future research should therefore consider the development and evaluation of numerous interventions or comprehensive multi-component interventions that can address the various needs of FCFs but that do not counteract their varying needs. Moreover, given the number of additional BCT groups that were identified and included in the current review, future research may consider the development of a new BCT taxonomy specific to FCFs that can take into account techniques that are addressed towards the FCF and addicted individual (Booth et al., 2021).

5. Conclusion

This systematic review and meta-analysis identified specific BCTs associated with greater effectiveness in psychosocial interventions of FCF-delivered interventions across a range of FCF, addicted person and relationship functioning outcomes. Overall, six BCT groups (goals and planning, repetition and substitution, reward and threat, scheduled consequences, restoring a balanced lifestyle and confrontation of the addicted person to engage in treatment), were identified as moderators of change from pre-intervention to post-intervention (i.e., within-group change) across the numerous FCF, addicted person and relationship functioning outcomes. In contrast, no BCT groups were identified as moderators of the difference between the intervention and control group at post-intervention (i.e., between-group difference) on any outcome.

While these findings need to be interpreted with caution given the limited estimates in some of these analyses and the insufficient level of intervention descriptions in some studies, they have important implications for the development of evidence-based FCF-delivered interventions. Specifically, these findings provide important insights into the active intervention components that may be effective in improving interventions that aim to impact FCF outcomes (i.e., interventions with restoring a balanced lifestyle and excluding goals and planning, reward and threat, scheduled consequences and confrontation of the addicted person to engage in treatment), addicted person outcomes (i.e., interventions with repetition and substitution, reward and threat, scheduled consequences and restoring a balanced lifestyle) and/or relationship functioning outcomes (i.e., interventions with confrontation of the addicted person to engage in treatment and without social support).

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Contributors

SM, SR and ND designed the study and wrote the protocol. SM conducted the literature search and provided summaries of previous research studies. SM and SA conducted the statistical analysis. SM wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Declaration of Competing Interest

The authors have no conflicts of interest to declare in relation to this article. The 3-year declaration of interest statement of this research team is as follows: SM, SR and ND have received funding from multiple

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Appendix A. Supplementary data

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