THE IMPACT OF SOCIAL NETWORK CONTACT ON RECOVERY FROM

ALCOHOL PROBLEMS

by

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A THESIS SUBMITTED TO THE UNIVERSITY OF BIRMINGHAM FOR THE

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Thesis Overview

The present thesis explored the role of social networks, including families and friends, in recovery from alcohol-use disorders. While literature exists linking social networks to alcohol usage, uptake of network-based interventions within clinical practice remains slow, and gaps remain within the evidence. The literature review reports a meta-analysis of randomised control trials assessing the efficacy of network-based interventions as compared with non-network-based controls. Evidence was found of small but significant advantages of network-based interventions over controls, across a range of intervention-types, populations, and outcomes.

The empirical paper reports a pilot case series study, using mixed methodology. It incorporates experience sampling methodology using a custom-made smartphone app. From a sample of six participants seeking treatment for alcohol use disorders, the paper reports on network characteristics, methodological viability, and qualitative accounts of participants' lived experiences of the impact of relationships and networks on their alcohol recovery. These accounts detail the complex ways in which network members may actively or passively promote continued alcohol use or abstinence, as well as the bidirectional link between alcohol usage and relationship quality with network members.

Taken together, the thesis provides a holistic investigation of network influences on alcohol usage among those with alcohol use disorders. The results of both the meta-analysis and the empirical paper have significant implications for clinical practice and future research.

Dedication

For all my supervisors who have guided me this far:

Louise, Siân, Gemma, Kelly, Tracey, Claire, Paul, Andrew, Harvey, Stephanie and

Alex.

And for all the staff and service users who have taught me so much.

For the ClinPsyD course staff.

For my fellow trainees – especially Emily, Hannah, Leo, Devon, Maddie and Chloe.

For my parents and sister.

Acknowledgements

Volume I Contents

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Literature Review: List of Illustrations

Literature Review: List of Tables

Empirical Study: List of Illustrations

Empirical Study: List of Tables

The effect of network and significant-other involvement on interventions for alcohol use disorders: A meta-analysis.

Word Count: 7,112

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Abstract

Background. Alcohol use disorders are widespread and are associated with a range of health problems. While prominent models of alcohol usage highlight the importance of the one's interpersonal relationships and networks, uptake of network-based interventions has been slow. The present meta-analysis sought to explore the efficacy of network-based interventions relative to non-network-based active comparators in randomised control trials – providing a timely update to previous meta-analyses and reviews.

Method and Analysis. A literature search of the Psycinfo, Medline R, Medline IPONIC, EMBASE and Cochrane databases was conducted. The meta-analysis assessed the impact of several network-based interventions on a range of alcohol-related outcomes. Subgroup analyses were performed to account for variation in methodology and risk of bias.

Results. The search yielded 20 studies, intervening in the alcohol usage of 2,372 participants. The analysis revealed small but significant advantages for network-based treatments over non-network-based controls in increasing the number of days participants were abstinent (Hedges g = 0.254, $p = 0.006$). Stronger effects were noted at six- and 12-months post-treatment (Hedges g = 0.335, $p < 0.001$; Hedges g = 0.284, $p = 0.006$, respectively), indicating a lasting benefit of network-based treatments compared to non-

network treatments. Outcomes of drinks per drinking day and units per week also showed

promising effects of a similar magnitude and valence. Where networks were

minimally/incidentally involved in control groups, effects were diminished; potentially

suggesting increased efficacy of controls.

Discussion. The results have important implications for clinical practice as well as future

research directions. High levels of heterogeneity were noted among studies, and

recommendations for future studies are made.

Introduction

In 2018, there were 595,131 adults in the UK with alcohol dependency, of which 47% had moderate to severe dependency (Williams et al., 2018), and in 2014 an estimated 41.2% of alcohol dependent people intended on reducing their alcohol consumption in the near future (Pryce et al., 2017). Heavy alcohol use has been linked to more than 60 medical conditions including oesophageal cancer, liver cancer, haemorrhagic stroke, liver cirrhosis and epilepsy (Room, Babor, & Rehm, 2005). It is reported that alcohol causes more harm than illicit drugs such as crack cocaine and heroin (Nutt, King, & Phillips, 2010).

Models of recovery from alcohol use disorders emphasise the role of social network influence. Marlatt and Gordon's (1985) relapse prevention model, while stemming from cognitive-behavioural theory, emphasises interpersonal and social factors such as the influence of others on decisions to drink or abstain (Larimer, Palmer, & Marlatt, 1999). This represented a change from previous biomedical, psychoanalytic and purist behavioural treatments which represented a 'disease model' focusing on an 'afflicted' individual (Chan, 2003; Edwards & Steinglass, 1995). The inclusion of families into substance use intervention gained traction throughout the 1970s and 1980s, and later approaches made use of systemic theories framing alcohol use as a behaviour which maintains equilibrium within a family system (de Maio, 1989). Despite the introduction of systemic approaches which traditionally focus on interpersonal relationships and enhancing communication, the majority of interventions have retained behavioural aspects to varying degrees (e.g., Behavioural Family Therapy, Behavioural Couples Therapy, Cognitive Behavioural Therapy).

While family approaches are commonplace in clinical research, the inclusion of an individual's wider network is less common. This is in spite of a growing body of literature linking an individual's network – specifically, their perceived attitudes and behaviours – with their consumption (Meisel, Clifton, MacKillop, & Goodie, 2015; Zywiak, Longabaugh, & Wirtz, 2002). This was translated into clinical practice by the likes of Galanter (1993) and Copello et al. (Social Behaviour and Network Therapy, SBNT; 2002) whose therapies engaged and developed networks supportive of change which were not limited to the immediate family.

In spite of a number of clinical and research advances towards family- and network-based (herein referred to collectively as 'network-based') approaches, uptake of such approaches appears low in clinical practice. Among their sample of 80 substance use clinicians in the USA, Haug, Shopshire, Tajima, Gruber, and Guydish (2008) reported that individually-based interventions were more commonly used (Cognitive-Behaviour Therapy, 61%; Motivational Enhancement Therapy, 53%) relative to network-based interventions (Multidimensional Family Therapy, 11%; Brief Strategic Family Therapy, 6%; Behavioural Couples Therapy, 2%). This is likely to reflect clinician- and organisation-related barriers to changing practices, as well as client preference for individual treatment (McCrady, Epstein, Cook, Jensen, & Ladd, 2011). In their survey of substance use clinicians, Fals-Stewart and Birchler (2001) reported that clinicians felt Behavioural Couples Therapy was too intensive, but would be more inclined to use it if it were brief, shown to be effective, and could be administered as an adjunct to other therapies. Given the discrepancy between the implementation of network-based interventions and their reported efficacy, the present author believed a meta-analysis

comparing the effectiveness of network-based interventions relative to non-network controls was warranted.

The question of whether involving significant others increases the efficacy of alcohol-focused intervention was the focus of an earlier meta-analysis by Meads, Ting, Dretzke, and Bayliss (2007). Meads and colleagues reviewed 34 randomised controlled trials (RCTs) broken down into the three forms of intervention as outlined by Copello, Velleman, and Templeton (2005); (a) intervention through family to encourage the drinker's entry into services, (b) joint involvement of network members in the treatment itself, and (c) interventions addressing the needs of family members in their own right. The author of the present meta-analysis reviewing past and more recent literature found a number of relevant studies published since the review by Meads and colleagues, indicating that an update would be appropriate. Furthermore, a number of studies featured in Meads' review were by William Fals-Stewart, the veracity of whose work has regrettably been brought into question in recent years (New York State Office of the Attorney General, 2010). The present meta-analysis, differs slightly from Meads and colleagues. Unlike Meads', the present meta-analysis focuses exclusively on interventions which *actively involve* the network in the treatment of the problem drinker, and specifically report alcohol outcomes. In part, the exclusion of other forms of intervention is a pragmatic one; studies examining interventions aimed at encouraging engagement with services largely report outcomes relating to engagement rather than alcohol usage. Similarly, those focusing on the needs of the family tend not to report alcohol outcomes of the 'alcohol using' individual. In this regard, the present meta-analysis is more sharply focused. Furthermore, several papers featured in the Meads

review have inactive (i.e., waitlist or treatment-as-usual) or absent comparators, while the
present meta-analysis aims to include only studies with active comparators, hence
focusing on the difference between network versus non-network approaches.

Since the review by Meads et al. (2007) there have been a number of reviews and
meta-analyses with similar but distinct foci. Templeton, Velleman, and Russell (2010)
published a systematic review on the inclusion of families in the treatment of alcohol
misuse. Their review presents 43 publications and represents a broad overview of the
literature given that this was the first such review on the area. The review reports a variety
of papers assessing different interventions and reporting on a range of outcomes. This led
to high levels of heterogeneity across the papers which made meta-analysis unfeasible,
according to the authors. With much greater specificity, Powers, Vedel, and Emmelkamp
(2008) conducted a meta-analysis examining the efficacy of Behavioural Couples
Therapy (BCT) on alcohol and drug use. This meta-analysis, indicating a small to medium
effect of BCT on frequency of use over control groups, includes a number of studies by
Fals-Stewart, and reports on drug outcomes which are beyond the remit of the present
meta-analysis. Finally, Ariss and Fairbairn (2020) recently published a meta-analysis on
the effect of significant-other involvement in substance use treatment. While representing
a thorough and valuable review, their focus differs from the present meta-analysis in
several areas. From their selected papers, only three papers focus on alcohol treatment for
adults (a fourth paper does not separate alcohol and drug outcomes). Among the
remaining papers, the majority focus on adolescent alcohol usage, or illicit drug use.
Furthermore, a number of appropriate papers known to the present author were not

yielded from Ariss and Fairbairn's search strategy. As such, there is a high degree of
heterogeneity among the papers included, with some notable omissions.

The present meta-analysis therefore sought to examine the efficacy of network-
based interventions – that is, those which actively involve the networks of people with
alcohol problems – relative to an active non-network comparator when treating alcohol
use disorders in adults. The participants were individuals with a diagnosis of alcohol use
disorder or with 'alcohol problems'; a term encapsulating those with a diagnosis of
alcohol use disorder or with problematic alcohol usage for which they are seeking
treatment. The primary outcome of focus was alcohol usage. Adolescent populations were
excluded from the present meta-analysis. This was because adolescent interventions were
recently reviewed by Gilligan et al. (2019) in their meta-analysis. Furthermore, adolescent
studies often focused on prevention and, in those which targeted alcohol usage, often
grouped alcohol use with other drugs and delinquent behaviours, or had lower thresholds
for 'problematic usage'. As such, adolescent literature was not felt to equate to literature
on adult alcohol problems. While justifiably considered a 'network intervention',
Alcoholics Anonymous (AA) and other 12-step programmes are excluded from the
present meta-analysis. There were two main reasons for this; firstly, AA and 12-step
programmes are specifically the focus of a recent meta-analysis by Kelly, Humphreys,
and Ferri (2020). Secondly, these programmes are largely peer-to-peer, non-professional
support networks rather than protocol-driven interventions delivered in treatment settings
(Kelly et al., 2020). The use of active controls was chosen as other control types, such as
waitlist or treatment as usual, often overestimate treatment effects or fail to establish

whether treatment effects are due to specific treatment components or non-specific factors such as attention (Guidi et al., 2018).

Method

Literature Search

To assess the efficacy of network-based interventions, the present meta-analysis sought to synthesis evidence from randomised controlled trials (RCTs) in which network-based interventions were compared with non-network-based active controls. RCTs were exclusively chosen as they represent the highest level of scientific evidence (Burns, Rohrich, & Chung, 2011). In terms of the PICO (Population, Intervention, Comparator, Outcome) framework (Higgins et al., 2019), the present meta-analysis focused on Populations comprising adults of working age (18 – 65) with alcohol use disorders or problematic alcohol usage for which they are seeking treatment. In terms of Interventions, the present meta-analysis required network-interventions (that is, interventions which enlist, target or modify one's family or surrounding social network) designed to treat alcohol problems. Comparators were required to be active interventions which did not involve the wider network (e.g., individual treatments). In terms of Outcomes, studies were required to report outcomes related to levels of alcohol consumption such as frequency, quantity or abstinence measures.

A literature search of the Psycinfo, Medline R, Medline IPONIC, EMBASE and Cochrane databases was conducted. A number of terms relating to alcohol use were combined using the 'OR' function (i.e., 'alcoholism' OR 'drinking behaviour' etc.).

Separately, a number of terms pertaining to networks were combined using the 'OR' function (i.e., 'famil*' OR 'significant others' etc.). Then, terms relating to intervention were combined using the 'OR' function (i.e., 'treatment*' OR 'intervention*' etc.). The results of these three searches (studies referencing alcohol use, networks and interventions) were then combined using the 'AND' function. A separate search was conducted specifically targeting known network therapies (i.e., 'BCT' OR 'SBNT' etc.) and terms relating to alcohol use. A final search relating to study design (i.e., 'trial' OR 'RCT' etc.) was run. These results were then combined with all of the above searches. A full description of the search terms can be found in Table 1. The full search strategy is outlined in Figure 1. The search terms differed slightly when using the Cochrane database due to differences in the available Boolean operators and the greater categorisation of terms using Medical Subject Headings (MeSH). This is outlined in Appendix 1. However, the search strategy as outlined in Figure 1, was the same when searching the Cochrane database.

The literature search yielded 4,539 titles and abstracts which were screened by the first reviewer (TW) to create a shortlist of 225 papers which were then read. Where there was uncertainty about inclusion, this was discussed and clarified with a second reviewer (AC). Reasons for inclusion and exclusion are qualified in Table 2. The search strategy, application of the exclusion criteria, and results are summarised in Figure 2. The twenty studies included in the final meta-analysis are described in Table 3.

Table 1. *Search terms used.*

Alcohol Terms Terms relating to alcohol use, combined using OR function.	'alcoholism' (exp') OR 'alcoholic*' OR 'drinking behaviour (exp)' OR 'alcohol drinking patterns (exp)' OR 'alcohol abuse (exp)' OR 'alcohol-focus*' 'alcohol adj ('abuse' OR 'use' OR 'misuse' OR 'addiction' OR 'disorder*' OR 'dependen*' OR 'dependan*')'
Network Terms Terms relating to networks and families, combined using OR function.	'couple*' OR 'partner*' OR 'spous*' OR 'martial*' OR 'married' OR 'conjoint*' 'famil*' OR 'family adj systems' OR 'family relations (exp)' 'CSO' OR 'significant adj other' OR 'significant others (exp)'
Intervention Terms Terms relating to interventions, combined using OR function.	'treatment*' OR 'intervention*' OR 'therap*' OR 'counsel*' OR 'skills adj training'
Known Interventions Terms relating to known network therapies, combined using OR function.	'BCT' OR 'behavio* adj couple*' 'network adj therapy', 'SBNT' OR 'social adj behavio' 'coping skills training' 'CRAFT' OR 'community adj reinforce*' 'family therapy (exp)' 'UKATT' 'pressure adj2 change'
Trial Terms Terms referencing being a trial, combined using OR function.	'trial' OR 'clinical trials (exp)' OR 'experimental design (exp)' 'RCT' OR 'randomi#sed control*' OR 'random* adj2 assign*' 'intervention (exp)' OR 'treatment outcome (exp)' OR 'treatment effectiveness evaluation (exp)'

'exp' = topic exploded in database; 'adj' = adjacent to; 'adj2' = within two words of
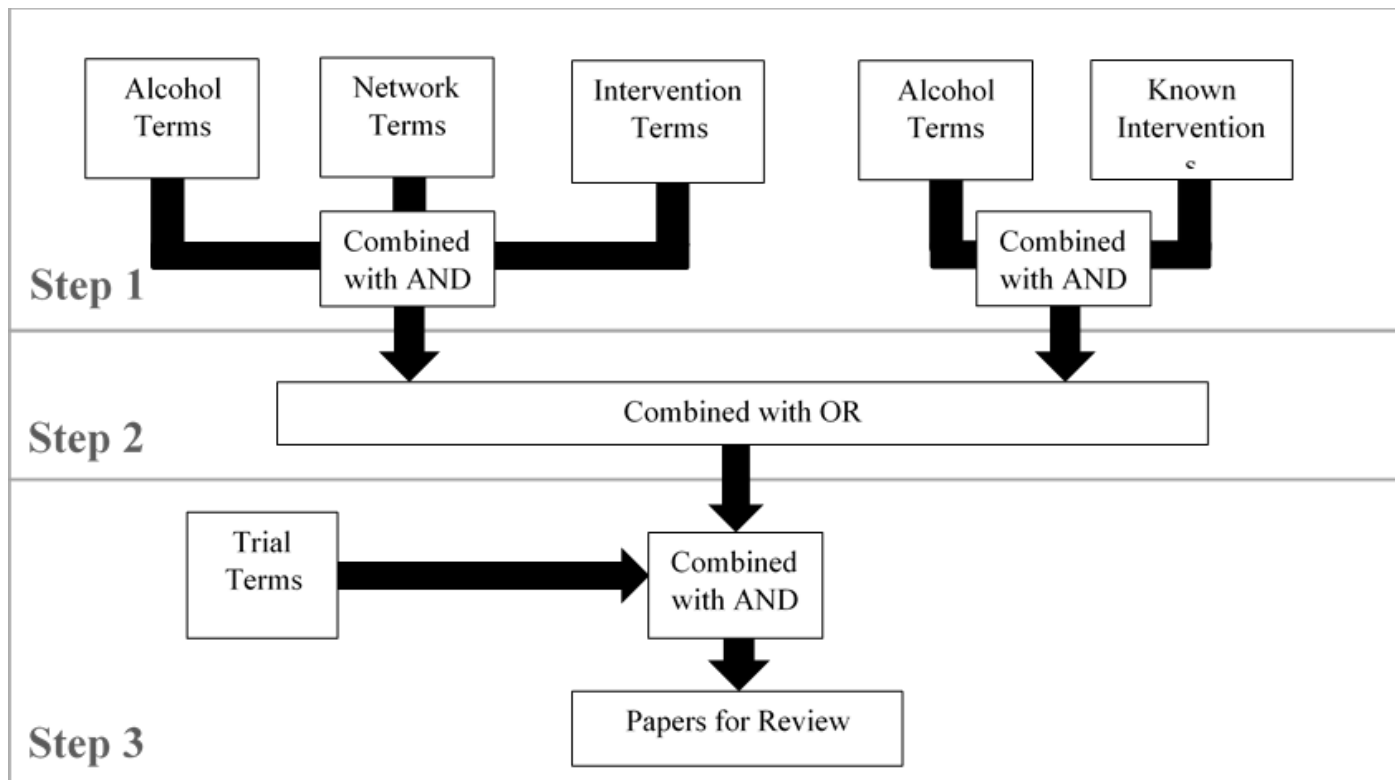
Figure 1. Search strategy outlined used.

Table 2. *Rationale for inclusion and exclusion criteria.*

Exclusion Criterion	Rationale
Population	Studies evaluating adolescents and children were excluded as this substantial literature is reviewed elsewhere.
Control	Inactive, waitlist or absent controls excluded as these can exaggerate study-level effects.
Sample Overlap	Samples must not be analysed multiple times within a meta-analysis.
Drugs and Gambling	Other drug-use or addictions are beyond the remit of the present meta-analysis. Some studies failed to separate alcohol- and drug-focused elements or outcomes.
Network intervention in both arms	To evaluate effect of network-based interventions, the control must not have an active network component.
Not an RCT	Case studies, non-randomised trials, qualitative studies and prevalence are excluded. Studies required to be RCTs as highest level of evidence.
Fals-Stewart	Regrettably, serious concerns have been raised about the veracity of William Fals-Stewart's findings. Erring on the side of caution, this meta-analysis excludes the work of this researcher. One exception is made where Fals-Stewart is not the first author nor the grant holder (Lam, Fals-Stewart, & Kelley, 2009).
Unable to Access	Study was not found after reasonable effort, or inaccessible.
Inclusion Criterion	
Population	Populations were required to be adults seeking treatment for alcohol use disorders or problematic alcohol usage.
Intervention	Studies required to report network-based interventions focusing on alcohol problems.
Comparator	Studies were required to have an active non-network-based comparator.
Outcomes	Outcomes related to levels of alcohol consumption (frequency, quantity or abstinence) were required.
Peer-reviewed journal article	Studies were required to be published in peer-reviewed journals. Books and dissertations were excluded on these grounds.
Reporting original results	Studies were required to report original results. Reviews and protocols were excluded on these grounds.

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│ Psycinfo     │  │ Medline R    │  │ Medline IPONIC│  │ EMBASE       │  │ Cochrane     │
│              │  │              │  │              │  │              │  │              │
│ N = 2320     │  │ N = 194      │  │ N = 1376     │  │ N = 2075     │  │ N = 350      │
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│ Titles and Abstracts   │   │ Duplicates removed   │
│ Screened   │ ──────────────────────▶│   │
│   │   │ N = 1776   │
│ N = 4539   │   └──────────────────────────────┘
└──────────────────────────────┘

Excluded, N = 4314

Reason for Exclusion (N)

Not Relevant (3043); Population (422); Books (287); Reviews or Meta Analyses (229); Intervention (112); Not an RCT (81); Not Journal Articles (54); Illicit Drugs or Gambling (46); Study Protocol (40)

┌──────────────────────────────┐
│ Papers Reviewed   │
│   │
│ N = 225   │
└──────────────────────────────┘

Excluded, N = 205

Reason for Exclusion (N)

Sample Overlap (53); Network intervention in both arms (26); Not an RCT (25); Outcomes (23); Intervention (18); Inactive, Waitlist or No Control (16); Not Relevant (14); Dissertation (8); Fals-Stewart (7); Population (7); Unable to Access (3); Book Chapter (2); Study Protocol (2); Review (1)

┌──────────────────────────────┐
│ Meta-Analysed Papers   │
│   │
│ N = 20   │
└──────────────────────────────┘

Figure 2. Flow chart demonstrating search strategy.

Table 3. *Papers included in the meta-analysis.*

#	Citation	Label	N	% Male *(primary user)*	Network-Based Intervention	Non-Network-Based Control	Outcomes
1	Barber and Crisp (1995)	Barber 1995	20	83	*Befriender intervention plus drinking diary.* Drink diary, befriender, non-drinking recreational activities, referral for counselling, reinforcement of sobriety	*Standard outpatient treatment with drinking diaries.*	Drinks/Week *(self-report; drink diary)*
2	Bowers and Al-Redha (1990)	Bowers 1990	16	88	*Couples therapy.* Communication training, emotional expression, assertiveness and feedback.	*Individual therapy.* Open ended therapy ranging from 3 – 14 weeks, developing therapeutic relationship and making changes in significant areas of the participants' lives.	Drinks/Week *(self-report; questionnaire)*
3	Hartmann et al. (2020)	Hartmann 2020	40	100	*BCT plus Incentives.* Incentives for negative tests, contracting, relaxation, trigger management, distraction, cost-benefit, communication training.	*Incentives Alone.* Financial incentives for negative breathalyser tests.	Percentage negative breathalyser tests *(breathalyser)*
4	Lam, Fals-Stewart, and Kelley (2009)	Lam, 2009	20	100	*BCT.* Trigger management, contracting, communication training, problem-solving, reinforcement of sobriety.	*IBT.* 12 sessions of individual CBT focusing on coping strategies for alcohol use.	PDA *(self-report; TLFB)*
5	Litt, Kadden, Kabela-Cormier, and Petry (2007)	Litt 2007	140	58	*Network Support.* Acceptance, Surrender, changing social network, trigger management, assertiveness, non-drinking activities.	*Case Management.* Identify areas for change in participants' lives, explore links with these and alcohol use, identify resources to action changes, provide ongoing support. Avoid recommending social support.	PDA, PPA, DPDD Drinking *(self-report; Form-90)* Consequences

#	Citation	Label	N	% Male *(primary user)*	Network-Based Intervention	Non-Network-Based Control	Outcomes
6	Longabaugh, Wirtz, Beattie, Noel, and Stout (1995)	Longabaugh, 1995	125	69	*Relationship Enhancement.* Relational reinforcement of sobriety, communication training, problem solving, cognitive restructuring, incentivisation.	*Extended individual CBT.* Trigger management, cognitive restructuring, assertiveness, problem-solving.	PDA *(self-report; TLFB)*
7	McCrady, Epstein, Cook, Jensen, and Hildebrandt (2009)	McCrady 2009	102	0	*ABCT.* Self-monitoring, functional analysis, coping skills, distraction, trigger management, communication training, problem solving.	*ABIT.* Self-monitoring, functional analysis, coping skills, trigger management.	PDA, PDH *(self-report; TLFB corroborated by spouse-report)*
8	McCrady, Noel, and Abrams (1986)	McCrady 1986	24	73	*BMT.* Self-monitoring, trigger management, cognitive restructuring, drink refusal training, assertiveness, relaxation. Relationship enhancement, shared recreation, communication training, emotional expression, joint problem-solving, reinforcement of sobriety.	*Minimal spouse involved alcohol-focused therapy.* Self-monitoring, trigger management, cognitive restructuring, drink refusal training, assertiveness, relaxation. Spouse present but not involved.	PDA *(self-report; TLFB corroborated by spouse-report)*
9	McCrady, Paolino Jr, Longabough, and Rossi (1979)	McCrady 1979	33	61	*Couples joint admission or couples' group.* Problem solving, trigger management, coping strategies, conflict resolution, communication training.	*Individual therapy.* Group therapy focusing on trigger management and coping strategies.	Quantity-Frequency Measure *(self-report corroborated by spouse-report)*
10	Monti et al. (1990)	Monti 1990	37	100	*CST with Family.* High risk situation training, communication training, emotional expression and assertiveness.	*Individual CST.* High risk situation training, assertiveness, communication training.	PDA, DPDD *(self-report)*

#	Citation	Label	N	% Male *(primary user)*	Network-Based Intervention	Non-Network-Based Control	Outcomes
11	Monti et al. (2014)	Monti 2014	406	69	*SO-involved MI*. Motivational Interviewing (Miller & Rollnick, 2002) incorporating significant other feedback.	*Individual MI.*	Drinks/Week, PDH, Drinking *(self-report)* Consequences
12	Nattala, Leung, Nagarajaiah, and Murthy (2010)	Nattala 2010	60	100	*Dyadic Relapse Prevention*. Trigger management, drink refusal training, budgeting, problem-solving.	*Individual Relapse Prevention.*	PPA, PDA *change scores (self-report; Form-90-AQ corroborated by family)*
13	Neto, Lambaz, Aguiar, and Chick (2008)	Neto 2008	209	84	*SCT*. Involvement of significant others in consultations, assertiveness among family members, reinforcement of sobriety.	*Outpatient Therapy*. Medication, alcohol psychoeducation, encouragement to abstain, AA signposting, drinking pattern assessment.	Cumulative Days Abstinent, DPDD, time to first drink *(self-report; TLFB)*
14	O'Farrell, Cutter, and Floyd (1985)	O'Farrell 1985	34	100	*Behavioural or Interactional couples' groups*. Contracting, behavioural rehearsal, communication training, shared recreation, emotional expression, problem-solving.	*Individual outpatient counselling*. 4 sessions of supportive counselling, Antabuse, participation in AA, and encouragement of abstinence.	PDA *(self-report; TLFB corroborated by spouse-report)*
15	Orford (2005)	Orford et al., 2005 (UKATT)	686	74	*SBNT*. Identifying and engaging abstinent networks, communication training, coping skills, non-drinking activities.	*MET*. 3 sessions of motivational interviewing (Miller & Rollnick, 2002).	PDA, DPDD, Alcohol Problems Questionnaire *(self-report; Form-90)*
16	Schumm, O'Farrell, Kahler, Murphy, and Muchowski (2014)	Schumm 2014	105	0	*BCT*. Contracting, trigger management, communication training, shared activities, emotional expression.	*IBT*. 26 sessions based on 12-step oriented counselling.	PDA, Drug Consequences *(self-report; TLFB corroborated by spouse-report)*

#	Citation	Label	N	% Male *(primary user)*	Network-Based Intervention	Non-Network-Based Control	Outcomes
17	Slesnick and Zhang (2016)	Slesnick 2016	165	0	*EBFT*. Systemic reframing, communication training, problem-solving, vocational support, targeting of problematic family interactions.	Women's Health Education. 12-session manualised psychoeducation on women's health.	PDA *(self-report; Form-90)*
18	Sobell, Sobell, and Leo (2000)	Sobell 2000	43	75	*Spouse-Directed MI*. Self-monitoring, goal setting, high risk situation training, motivational interviewing, cognitive restructuring. Emphasis on the active role the spouse can play.	*Individual MI*. Self-monitoring, goal setting, high risk situation training, motivational interviewing, cognitive restructuring. Spouse is present but not addressed.	PDA, DPDD, PDH *(self-report; TLFB)*
19	Vedel, Emmelkamp, and Schippers (2008)	Vedel 2008	64	86	*BCT*. Behavioural rehearsal, communication training, shared recreation, emotional expression, problem-solving.	*CBT and MET*. Motivational interviewing, self-monitoring, functional analysis, trigger management, coping skills, relapse prevention.	Units/Week *(self-report)*
20	Walitzer and Dermen (2004)	Walitzer 2004	43	100	*Couples Alcohol-Focused Therapy*. Reinforcement of sobriety, trigger management, constructive feedback, high risk situations training.	*IBT*. Behavioural strategies for reducing consumption, drink refusal training, trigger management.	PDA, PDH, Drinking Consequences *(self-report; TLFB corroborated by spouse)*.

Treatments: (A)BCT = (Alcohol) Behavioural Couples Therapy; IBT = Individual Behaviour Therapy; CBT = Cognitive Behaviour Therapy; ABIT = Alcohol Behavioural Individual Therapy; BMT = Behavioural Marital Therapy; CST = Communication Skills Training; MI = Motivational Interviewing; SCT = Sequential Combined Therapy; SBNT = Social Behaviour Network Therapy; MET = Motivation Enhancement Therapy; EBFT = Ecologically Based Family Therapy. **Outcomes:** PDA = Percentage Days Abstinent; PPA = Proportion of Participants Abstinent; DPDD = Drinks per Drinking Day; PDH = Percentage Days Heavy Drinking; TLFB = Timeline Follow-back interview

Risk of bias assessment

The present meta-analysis assessed each study on several sources of bias as outlined by Higgins et al. (2011). Higgins and colleagues' framework was chosen as it pertains specifically to randomised control trials and is the framework frequently used in Cochrane meta-analyses. The risk of bias tool assesses studies on six main sources of bias likely to produce over-estimation of treatment effects. It rates these areas as being low risk of bias, high risk where the bias may have impacted on reported treatment effects, or unclear risk where insufficient information is given. Ratings of each study are provided in Table 4 with justification for each rating detailed in Appendix 2.

Table 4. *Quality appraisal of all studies according to Higgins' et al. (2011) Risk of Bias tool.*

	Random Sequence Allocation	Allocation Concealment	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Data	Selective Reporting	Other Bias
Barber 1995	?	?	?	-	-	+	
Bowers 1990	?	-	-	-	+	+	
Hartmann 2020	+	+	?	+	-	-	
Lam, 2009	?	?	?	-	-	+	
Litt 2007	+	?	-	-	-	+	
Longabaugh, 1995	+	?	?	-	-	+	-
McCrady 1979	?	?	?	?	-	+	
McCrady 1986	+	?	?	-	-	-	
McCrady 2009	+	?	-	-	-	+	
Monti 1990	-	-	?	-	-	+	
Monti 2014	+	?	?	+	?	+	
Nattala 2010	?	?	?	-	-	-	-
Neto 2008	+	?	-	+	-	+	
O'Farrell 1985	+	?	?	-	-	+	
Orford 2005 (UKATT)	+	?	?	?	-	+	

Schumm 2014	+	+	?	-	+	+	
Slesnick 2016	?	?	?	-	+	+	
Sobell 2000	?	?	?	?	-	+	
Vedel 2008	?	?	?	-	-	+	
Walitzer 2004	?	?	?	-	?	+	

Abstinence Outcomes

In order to evaluate the effectiveness of network-based interventions, alcohol-related outcomes were extracted from the studies. Of the 20 studies included in the meta-analysis, 14 studies reported a measure of days in which participants reported abstinence. While 11 of these reported percentage of days abstinent (PDA), Hartmann 2020 reported the proportion of negative breathalyser results from twice-daily testing, Walitzer 2004 reported the average number of days abstinent in the previous 30 days, and Neto 2008 reported the cumulative days abstinent over the 180-day period. Despite this methodological variation, all 14 studies reporting abstinent measures were meta-analysed together. As the most consistently reported outcome, days abstinent represents the main outcome in the present meta-analysis, and is subject to subsequent analyses of study quality, publication bias, subgroup analyses and influential study analysis. Other outcomes reported less frequently are presented subsequently, but not analysed at the same depth due to limited data.

For most of the studies abstinence outcomes were reported as a mean (or mean difference), a standard deviation and number of participants (n) for both the treatment and control group. From these, the Hedges g standardised mean difference and standard error were calculated for each outcome measure. When means, standard deviation and n-sizes

were not reported then F or t statistics were transformed into estimates of Hedges g. For the purposes of clarity, the direction of the effect was adjusted so that a positive effect size indicated a positive treatment effect, and a negative effect size indicated a negative treatment effect. Subgroup analyses assessed the impact of study quality and design on estimated effects (e.g., family versus network interventions).

Selection of the meta-analytic model

The distribution of primary study standardised mean differences (SMDs) in abstinent days is shown in Figure 3 at post-intervention, 6-month follow-up and 12-month follow-up. In each case, the variance of the true effect (tau^2) was calculated using the DerSimonian-Laird estimator. As can be seen from Figure 3, there was no evidence of non-normality in the distribution of the standardised mean differences in the random effects model at post-treatment and 12 months.

There was some evidence of non-normality at 6 months, however 95% of the study effects fell within the 95% confidence interval for the expected normal values. This indicated that the use of the DerSimonian-Laird estimate was an appropriate method for the calculation of the variation of the true effect in each case.

The omnibus test

As the studies frequently reported outcomes at multiple timepoints, these are reported separately in Table 5 for post-treatment (10 studies, 1378 participants; *excluding partners and network members*), 6-month (11 studies, 1004 participants) and 12-month outcomes (10 studies, 1463 participants).
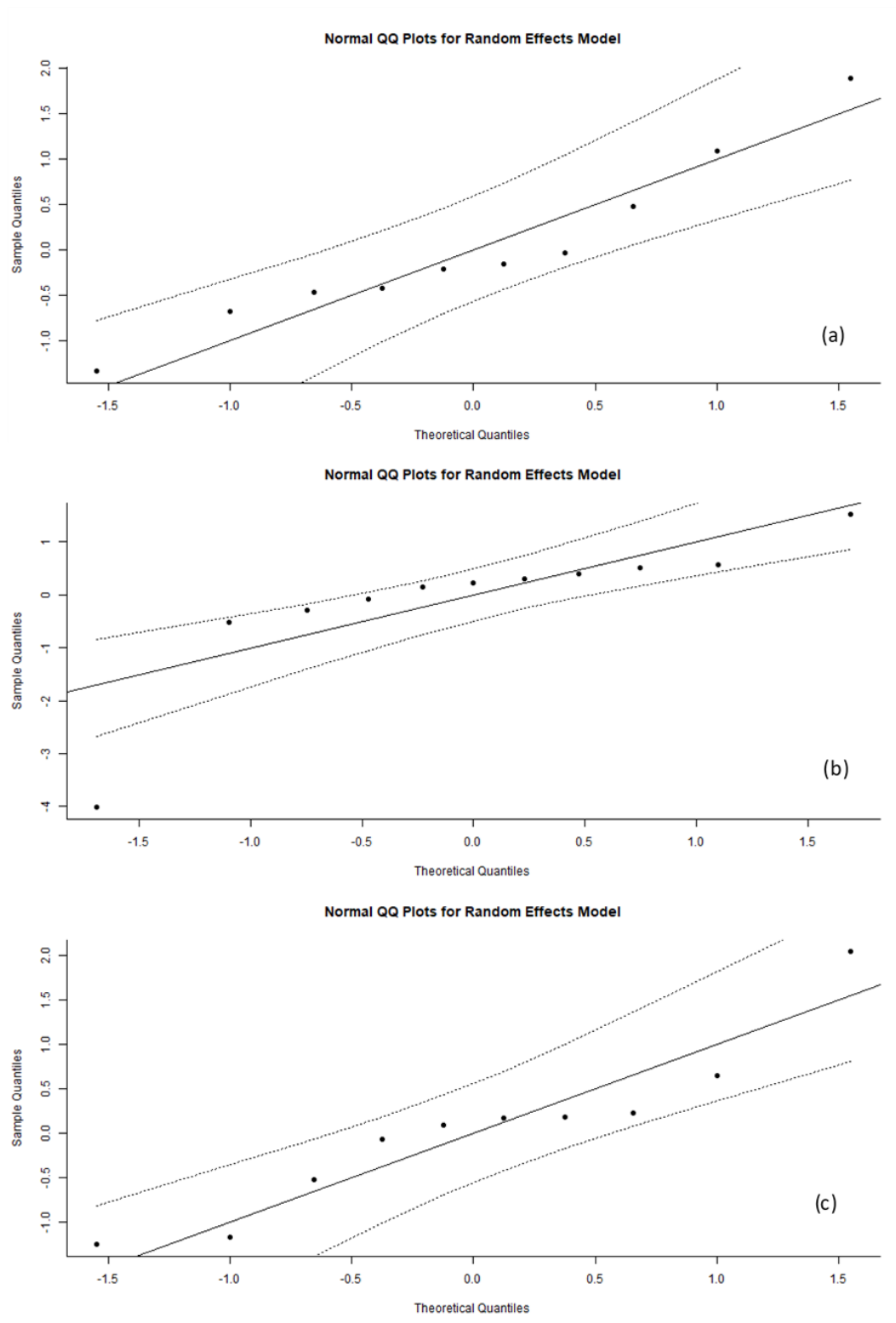
Figure 3. QQ plots of the distribution of the standardised mean difference within the primary studies using a random effects model at (a) post-treatment, (b) 6-month follow-up, and (c) 12-month follow-up.

Table 5. *Treatment effect of primary studies reporting outcomes at post-treatment, 6 months and 12 months.*

Study	SMD	Lower 95%-CI	Upper 95%-CI	%W (Fixed)	%W (Random)
Post-treatment					
Hartmann 2020	0.1985	-0.4228	0.8199	3.1	6.4
Lam 2009	0.2399	-0.6398	1.1196	1.5	3.6
Litt 2007	0.7068	0.3522	1.0614	9.4	12.9
McCrady 2009	0.1985	-0.2092	0.6062	7.1	11.1
O'Farrell 1985	-0.0129	-0.7163	0.6904	2.4	5.3
Orford 2005	0.0186	-0.1327	0.1699	51.4	21.7
Schumm 2014	0.1469	-0.2418	0.5355	7.8	11.8
Slesnick 2016	0.3637	0.0361	0.6912	11.0	13.9
Sobell 2000	0.0910	-0.5112	0.6932	3.2	6.7
Walitzer 2004	0.6357	0.0228	1.2485	3.1	6.5
6-month follow-up					
Lam 2009	0.3049	-0.5767	1.1865	2.1	5.4
Litt 2007	0.7976	0.4374	1.1578	12.9	11.2
Longabaugh 1995	0.1110	-0.2402	0.4621	13.5	11.3
McCrady 1986	-2.2151	-3.2119	-1.2182	1.7	4.6
McCrady 2009	0.3805	-0.0365	0.7976	9.6	10.4
Monti 1990	-0.0191	-0.6638	0.6256	4.0	7.6
Neto 2008	0.1947	-0.0771	0.4665	22.6	12.3
O'Farrell 1985	0.3700	-0.3389	1.0788	3.3	7.0
Schumm 2014	0.4235	0.0291	0.8179	10.7	10.7
Slesnick 2016	0.3082	-0.0236	0.6401	15.1	11.5
Walitzer 2004	0.4859	-0.1278	1.0997	4.4	8.0
12-month follow-up					
Lam 2009	0.3748	-0.5093	1.2590	1.5	4.1
Litt 2007	0.8533	0.4897	1.2169	9.1	12.0
Longabaugh 1995	-0.0669	-0.4362	0.3024	8.8	11.9
McCrady 2009	0.3354	-0.0858	0.7566	6.7	10.6
O'Farrell 1985	0.5558	-0.1599	1.2715	2.3	5.7
Orford 2005	0.0225	-0.1377	0.1827	46.6	17.6
Schumm 2014	0.2646	-0.1292	0.6583	7.7	11.3
Slesnick 2016	0.3467	0.0125	0.6808	10.7	12.8
Sobell 2000	0.0910	-0.5112	0.6932	3.3	7.1
Walitzer 2004	0.3181	-0.2981	0.9344	3.2	6.9

A random effects model was calculated using the generic inverse variance method at post-treatment, 6 and 12 months. At post-treatment, the random effects model suggested a weighted average SMD of 0.254 (z = 2.75, p = 0.006) and a 95% confidence interval of between 0.073 to 0.435. The model demonstrated an acceptable level of heterogeneity (tau^2 = 0.0333, Higgin's I^2 = 45.8%; χ^2 = 16.60, p = 0.055) – which the present meta-analysis defines as I^2 < 50%, or moderate heterogeneity as outlined by

Study	TE	seTE	Standardised Mean Difference	SMD	95%-CI	Weight
Post-Treatment						
Hartmann 2020	0.20	0.3170		0.20	[-0.42; 0.82]	2.3%
Lam 2009	0.24	0.4488		0.24	[-0.64; 1.12]	1.4%
Litt 2007	0.71	0.1809		0.71	[0.35; 1.06]	4.1%
McCrady 2009	0.20	0.2080		0.20	[-0.21; 0.61]	3.7%
O'Farrell 1985	-0.01	0.3589		-0.01	[-0.72; 0.69]	2.0%
Orford 2005 (UKATT)	0.02	0.0772		0.02	[-0.13; 0.17]	5.9%
Schuum 2014	0.15	0.1983		0.15	[-0.24; 0.54]	3.8%
Slesnick 2016	0.36	0.1671		0.36	[0.04; 0.69]	4.3%
Sobell 2000	0.09	0.3072		0.09	[-0.51; 0.69]	2.4%
Walitzer 2004	0.64	0.3127		0.64	[0.02; 1.25]	2.4%
Random effects model				**0.25**	**[0.07; 0.43]**	**32.4%**
Heterogeneity: $I^2 = 46\%$, $\tau^2 = 0.0333$, $p = 0.06$						
6 Months						
Lam 2009	0.30	0.4498		0.30	[-0.58; 1.19]	1.4%
Litt 2007	0.80	0.1838		0.80	[0.44; 1.16]	4.1%
Longabaugh 1995	0.11	0.1792		0.11	[-0.24; 0.46]	4.1%
McCrady 1986	-2.22	0.5086		-2.22	[-3.21; -1.22]	1.2%
McCrady 2009	0.38	0.2128		0.38	[-0.04; 0.80]	3.6%
Monti 1990	-0.02	0.3289		-0.02	[-0.66; 0.63]	2.2%
Neto 2008	0.19	0.1387		0.19	[-0.08; 0.47]	4.8%
O'Farrell 1985	0.37	0.3617		0.37	[-0.34; 1.08]	2.0%
Schumm 2014	0.42	0.2012		0.42	[0.03; 0.82]	3.8%
Slesnick 2016	0.31	0.1693		0.31	[-0.02; 0.64]	4.3%
Walitzer 2004	0.49	0.3131		0.49	[-0.13; 1.10]	2.4%
Random effects model				**0.22**	**[-0.04; 0.49]**	**33.9%**
Heterogeneity: $I^2 = 72\%$, $\tau^2 = 0.1270$, $p < 0.01$						
12 Months						
Lam 2009	0.37	0.4511		0.37	[-0.51; 1.26]	1.4%
Litt 2007	0.85	0.1855		0.85	[0.49; 1.22]	4.0%
Longabaugh 1995	-0.07	0.1884		-0.07	[-0.44; 0.30]	4.0%
McCrady 2009	0.34	0.2149		0.34	[-0.09; 0.76]	3.6%
O'Farrell 1985	0.56	0.3651		0.56	[-0.16; 1.27]	1.9%
Orford 2005 (UKATT)	0.02	0.0817		0.02	[-0.14; 0.18]	5.8%
Schumm 2014	0.26	0.2009		0.26	[-0.13; 0.66]	3.8%
Slesnick 2016	0.35	0.1705		0.35	[0.01; 0.68]	4.3%
Sobell 2000	0.09	0.3072		0.09	[-0.51; 0.69]	2.4%
Walitzer 2004	0.32	0.3144		0.32	[-0.30; 0.93]	2.4%
Random effects model				**0.28**	**[0.08; 0.49]**	**33.6%**
Heterogeneity: $I^2 = 59\%$, $\tau^2 = 0.0535$, $p < 0.01$						

Figure 1. Forest plot of effect sizes in each study. Effect sizes at zero indicate a null effect. Those above zero indicate an advantage for network-based interventions.

Higgins, Thompson, Deeks, and Altman (2003) – suggesting the studies were coherent and demonstrated consistent effect sizes. At 6-months, the random effects model suggested a weighted average of the SMD of 0.223 (z = 1.66, *p* = 0.096), favouring network-based interventions, and a 95% confidence interval of between -0.040 and 0.485. The model is not significant, and an unacceptable level of heterogeneity was observed in this model (tau^2 = 0.1270, Higgin's I^2 = 71.7%; χ^2 = 35.31, *p* < 0.001), suggesting that the estimates of SMD in the primary studies may be biased by the presence of uncontrolled or confounding factors at 6 months. At 12 months, the random effects model

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suggested a weighted average SMD of 0.284 ($z = 2.76$, $p = 0.006$) with a 95% confidence

interval of between 0.082 and 0.485. An unacceptable level of heterogeneity was

observed in this model ($tau^2 = 0.0535$, Higgin's $I^2 = 58.6\%$; $\chi^2 = 21.72$, $p = 0.01$)

suggesting that the estimates of treatment efficacy may be biased by confounding factors.

At post-treatment and 12 months, the treatment effects suggest a small effect of network-

based interventions relative to non-network intervention. The model at 6 months,

although not statistically significant, is of the same direction and similar magnitude to the

effects at post therapy and 12 months (Figure 4).

The impact of influential primary studies

The impact of disproportionately influential studies was assessed using a "leave-

one-out" analysis, in which the random effects model was calculated with each of the

primary studies removed in turn while recording the change in average effect size (i.e.,

influence) and heterogeneity (i.e., discrepancy). The result of this "leave-one-out"

analysis is presented on the Baujat plot (Baujat, Pignon, & Hill, 2002) in Figure 5. As can

be seen from Figure 5b (6-month follow-up), McCrady 1986 is both discrepant with the

bulk of the literature and is influential in terms of the meta-analytic synthesis. Therefore,

this study was reviewed to identify any factors that might account for its influence and

discrepancy and indicate that it should be removed from the analysis. McCrady and

colleagues, in their discussion, detail significant differences at baseline which indicated

that 50% of the couples' intervention group had been hospitalised in the previous year,

relative to 15% of the individual control. These baseline differences may account for the

discrepant result. Therefore, the random effects model was recalculated with the

McCrady 1986 removed at 6 months. The corrected random effects model reported a

synthesis of SMD of 0.335 (z = 5.05, $p < 0.001$, 95% CI 0.2050 to 0.4655). This corrected

model was significant and reported an acceptable level of heterogeneity in the primary

studies (tau^2 = 0.0082, Higgin's I^2 = 15.0%; χ^2 = 10.59, p = 0.30).
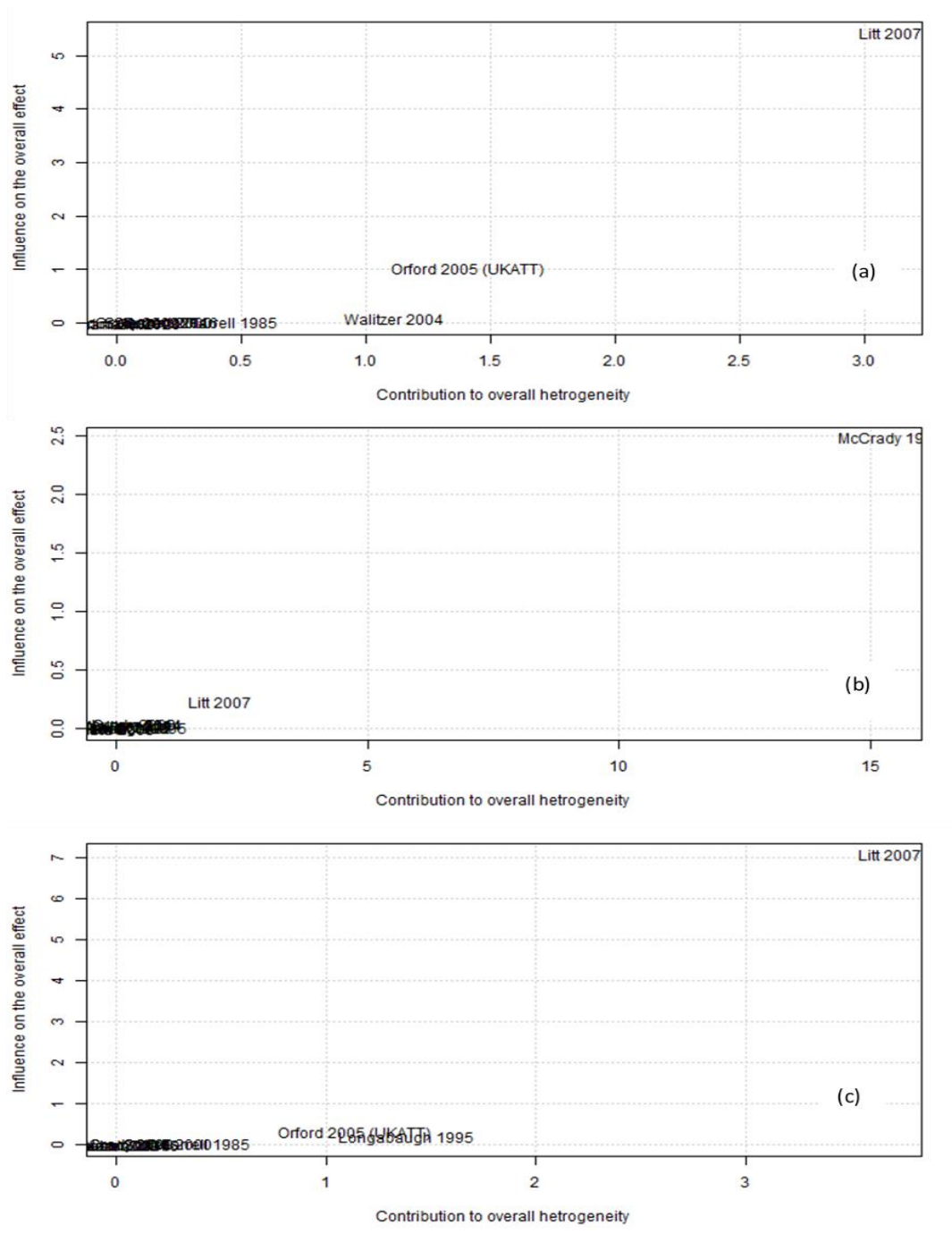
Figure 2. Baujat charts demonstrating the contribution of individual papers to overall
heterogeneity at (a) post-treatment, (b) 6 months, and (c) 12 months.

The corrected random effects model evidences a 50.22% increase relative to the uncorrected estimate and may be considered a small effect. That is, network interventions demonstrated a small advantage over non-network comparators. The forest plot for each follow-up following the removal of McCrady 1986 is presented in Appendix 3.

To a lesser extent, Litt's (2007) paper was also highlighted in the analysis as being discrepant and influential in the literature. While the present meta-analysis did not set out to review the impact of Alcoholics Anonymous (AA) involvement, it was noted that Litt's study was the only study to encourage AA attendance as part of intervention and not encourage attendance in control. Other studies treated AA involvement consistently across treatment arms. Litt reports significant difference in AA attendance between Network Support treatment and case management but, within Network Support, no significant difference in outcome between those who did and did not attend AA. While the presence of AA in the experimental group represents a confound, it was felt to represent a general difficulty in isolating the impact of AA attendance when assessing the impact of participants' networks. AA attendance is noted in other studies. As such, the paper was not removed from the analysis.

The effect of risk of bias in the primary studies

Studies were rated on their risk of bias according to the risk of bias tool outlined by Higgins et al. (2011). This tool was used as it is designed to assess the quality of randomised control trials and is frequently used in Cochrane reviews. The quality assessment for the studies presented in Table 4 with qualification of these ratings in Appendix 2. In order to assess the impact of study level risk of bias upon heterogeneity

at each timepoint, a series of subgroup analyses were conducted on the SMD for the risk

of bias ratings of "low risk" and "any risk" (i.e., unclear risk and high risk of bias

combined) for each of the 5 types of methodological bias. Performance bias was not

analysed as all studies were deemed unclear or high risk as blinding of therapists and

participants is not practicable in psychosocial interventions. This is presented in Table 6.

The subgroup analysis based on study quality found no significant differences

between studies based on any measure of study quality.

Table 6. *Subgroup analysis to examine the impact of study quality on reported effects. Asterisk indicates statistical significance at 95% confidence.*

	Low Risk			Any Risk				
	EFFECT	95% CI	k	EFFECT	95% CI	k	χ^2	*p*
Post-treatment								
Selection: Random Number Generation	0.217	-0.029; 0.463	6	0.352	0.102; 0.602	4	0.57	0.45
Selection: Allocation Concealment	0.176	-0.080; 0.432	3	0.297	0.031; 0.563	7	0.41	0.52
Detection Bias	0.199	-0.423; 0.820	1	0.260	0.064; 0.456	9	0.03	0.85
Attrition Bias	0.274	0.023; 0.524	2	0.258	0.020; 0.496	8	0.01	0.93
Reporting Bias	0.260	-0.064; 0.456	9	0.199	-0.423; 0.820	1	0.03	0.85
6-month follow-up								
Selection: Random Number Generation	0.369	0.156; 0.582	6	0.288	0.033; 0.542	4	0.23	0.63
Selection: Allocation Concealment	0.403	0.117; 0.690	2	0.324	0.134; 0.514	8	0.20	0.65
Detection Bias	0.195	-0.077; 0.467	1	0.376	0.212; 0.539	9	1.25	0.26
Attrition Bias	0.356	0.102; 0.610	2	0.336	0.138; 0.534	8	0.02	0.90
Reporting Bias	-	-	-	-	-	-	-	-
12-month follow-up								
Selection: Random Number Generation	0.296	0.003; 0.589	6	0.299	0.046; 0.552	4	<0.01	0.99
Selection: Allocation Concealment	0.298	0.010; 0.585	2	0.287	0.031; 0.542	8	<0.01	0.96
Detection Bias	-	-	-	-	-	-	-	-
Attrition Bias	0.312	0.058; 0.567	2	0.285	0.022; 0.527	8	0.02	0.88
Reporting Bias	-	-	-	-	-	-	-	-

Subgroup analyses and meta regression

To further explore the impact of study level covariates upon the efficacy of network interventions, a series of subgroup analysis were conducted (Table 7). The analyses revealed a significantly weaker effect at post-treatment for studies in which a network member was present in the control group. In these studies, there was no explicit role for network members in the control which would have warranted study exclusion. In two studies (Sobell 2000, Hartmann 2020), the network member was present in the control intervention. In Sobell 2000, the spouse's passive presence in the control was used to control for impact of their presence when assessing the impact of their direct participation. In Hartmann 2020, the partner was engaged in financial planning and goal setting. In six studies, the spouse attended the assessment, consultation, or first session, without having a role during the main intervention phase. These controls were compared with interventions where the spouse or network member was actively engaged in the intervention. A possible explanation for the observed difference is that even minimal network engagement may dilute study effects by increasing the efficacy of the control through inadvertently activating the mechanism of change associated with network-based interventions. These differences in effects are not observed at 6 and 12 months. Differences between studies which enlisted family members versus non-family networks or either (any significant other) were explored. While this analysis was significant at 6 months, further exploration revealed that this effect was driven by the single network-intervention study (Litt 2007). Without this study, the effect is non-significant (Family versus Any SO: $\chi^2 = 2.54$, $p = 0.11$). Finally, at 12 months, studies which included or

noted participation in AA in the network intervention demonstrated significantly greater efficacy than those with no explicit AA involvement.

As a number of studies examined the efficacy of Behavioural Couples Therapy (BCT) or interventions with significant overlap with BCT, these were compared with non-BCT studies. The subgroups analysis found no statistically significant differences between BCT or other interventions. Given the high variability in control group interventions, a subgroup analysis explored differences in effects between those that involved theoretically-based structured or manualised approaches and those which were less targeted, theoretically-based or structured. This distinction was informed by the Mesa Grande (Miller & Wilbourne, 2002) and NICE guidelines (National Institute for Health and Care Excellence, 2011) which recommend cognitive, motivational, behavioural and socially-based interventions. Subgroup analyses found significantly greater effects in papers where control groups were less structured or were not theoretically-informed.

The present subgroup analysis therefore suggested that a network-based component in the control group – even when simply passive presence – may dilute treatment effects although this is only observed immediately post-treatment. This is notable in that it suggests that even minimal network presence may improve treatment efficacy; a finding that is relevant to the scope of the present meta-analysis and has highly significant clinical implications. It also has implications for future study designs which may benefit from isolating network involvement. At this stage, it is not possible to draw conclusions about the efficacy of interventions specifically involving families versus non-family networks, due to the limited number of studies assessing the latter.

A meta-regression analysis on continuous moderator variables revealed no significant effects of publication year, mean sample age, baseline PDA or number of treatment sessions on reported study-level effects (Table 8).

Table 7. *Subgroup analysis of the impact of study-level effect on observed treatment effect. Asterisk indicates statistical significance at 95% confidence.*

	Post Treatment					
	Level	EFFECT	95% CI	k	$\chi 2$	*p*
Family or Network Intervention	Family	0.2493	0.0760 - 0.4227	8		
	Network	0.3432	-0.3301 - 1.0166	2	0.07	0.79
	Any SO	-	-	0		
Network involvement in control group	None	0.5282	0.1922 - 0.8642	2		
	Assessment	0.0795	-0.0472 - 0.2062	6	6.00	0.05*
	Intervention	0.1431	-0.2893 - 0.5755	2		
Theoretically-based structured control	Yes	0.0927	-0.0623 - 0.2477	5	2.93	0.09*
	No	0.3448	0.1014 - 0.5882	5		
Alcoholics Anonymous noted in the intervention	Yes	0.3312	-0.1186 - 0.7809	3	0.52	0.47
	No	0.1568	0.0060 - 0.3077	7		
BCT	Yes	0.1599	-0.0723 - 0.3921	5	0.81	0.37
	No	0.3419	0.0220 - 0.6618	5		
Population Sex	Male	0.2907	-0.0509 - 0.6324	4		
	Female	0.2530	0.0396 - 0.4664	3	0.03	0.98
	Mixed	0.2728	-0.2151 - 0.7608	4		
	6 Months Follow-up					
	Level	EFFECT	95% CI	k	$\chi 2$	*p*
Family or Network Intervention	Family	0.3725	0.1807 - 0.5643	6		
	Network	0.7976	0.4374 - 1.1578	1	9.81	0.007*
	Any SO	0.1451	-0.0588 - 0.3490	3		
Network involvement in control group	None	0.3330	-0.0129 - 0.6789	4		
	Assessment	0.4047	0.1697 - 0.6397	5	1.32	0.52
	Intervention	0.1947	-0.0771 - 0.4665	1		
Theoretically-based structured control	Yes	0.2338	0.0114 - 0.4563	5	1.17	0.28
	No	0.4083	0.1829 - 0.6337	5		
Alcoholics Anonymous	Yes	0.3842	0.1038 - 0.6645	5	0.35	0.56

	Level	EFFECT	95% CI	k	χ2	p
noted in the intervention	No	0.2816	0.0887 - 0.4745	5		
BCT	Yes	0.3908	0.1364 - 0.6451	4	0.15	0.70
	No	0.3228	0.0929 - 0.5526	6		
Population Sex	Male	0.2846	-0.0617 - 0.6309	4		
	Female	0.3626	0.1458 - 0.5795	3	0.15	0.93
	Mixed	0.3597	-0.0381 - 0.7575	3		

		12-Month Follow-up				
	Level	EFFECT	95% CI	k	χ2	p
Family or Network Intervention	Family	0.3153	0.1317 - 0.4990	7		
	Network	0.4212	-0.3923 - 1.2347	2	3.48	0.18
	Any SO	-0.0669	-0.4362 - 0.3024	1		
Network involvement in control group	None	0.3782	-0.1281 - 0.8845	3		
	Assessment	0.1275	-0.0104 - 0.2653	6	0.91	0.64
	Intervention	0.0910	-0.5112 - 0.6932	1		
Theoretically-based structured control	Yes	0.0656	-0.0650 - 0.1963	6	7.03	0.008*
	No	0.4983	0.2063 - 0.7903	4		
Alcoholics Anonymous noted in the intervention	Yes	0.5646	0.1573 - 0.9719	3	4.53	0.03*
	No	0.1029	-0.0188 - 0.2245	7		
BCT	Yes	0.3370	0.0815 - 0.5924	4	0.17	0.68
	No	0.2561	-0.0339 - 0.5462	6		
Population Sex	Male	0.4096	-0.0033 - 0.8225	3		
	Female	0.3185	0.1005 - 0.5365	3	0.38	0.83
	Mixed	0.2245	-0.1901 - 0.6390	4		

Table 8. *Meta-regression on continuous moderators.*

Post Treatment	Coefficient	SE	Z	p
Year of Publication	0.007	0.012	0.57	0.57
Mean age	0.0064	0.025	0.26	0.79
Number of Sessions	0.0095	0.019	0.51	0.61
Baseline PDA	-0.0197	0.018	-1.12	0.26
6 Months				
Year of Publication	0.009	0.009	0.99	0.32
Mean age	0.029	0.016	1.83	0.07
Number of Sessions	0.007	0.014	0.50	0.62
Baseline PDA	-0.015	0.011	-1.40	0.16

12 Months

	0.007	0.013	0.50	0.62
Year of Publication	0.007	0.013	0.50	0.62
Mean age	0.025	0.029	0.89	0.37
Number of Sessions	0.004	0.022	0.17	0.87
Baseline PDA	-0.006	0.017	-0.38	0.70

The impact of publication and small study biases

Publication bias is caused by the tendency for journals to preferentially publish significant results and neglect non-significant results. Small study bias is the tendency for studies with smaller sample sizes to show greater variability in their measurement of SMDs. These biases are identified using a funnel plot which plots the magnitude of the study's SMD estimate against the square root of the study's sampling variances. An absence of small studies reporting null effects, as indicated by notable asymmetry at the bottom of the plot, would suggest the presence of publication bias. In the present meta-analysis, the area associated with small studies reporting null effects is represented as the blue rectangle in the bottom left of the funnel in Figure 6. An absence of these studies may cause an overestimation of the meta-analytic mean.

As can be seen in Figure 6, there is no clear evidence of publication bias in the distribution of SMDs at post-treatment or 6 months. The absence of studies in the blue square is mirrored by an absence in the opposite green square (positive effects). Therefore, there is no evidence that smaller studies reporting null effects have been omitted from the literature. Rosenthal (1979) describes the calculation of a failsafe number; this method calculates the number of with non-significant results which would need to be included in the meta-analysis for the overall effect to be non-significant ($p > .05$). This procedure suggested that 39 studies would be required to reduce the observed SMD of 0.254 at post-

treatment to non-significance, and 77 studies would be required to reduce the observed

SMD of 0.335 at 6 months to non-significance. These indicate that the observed effects

at post-treatment and 6 months are robust to studies missing due to publication bias.
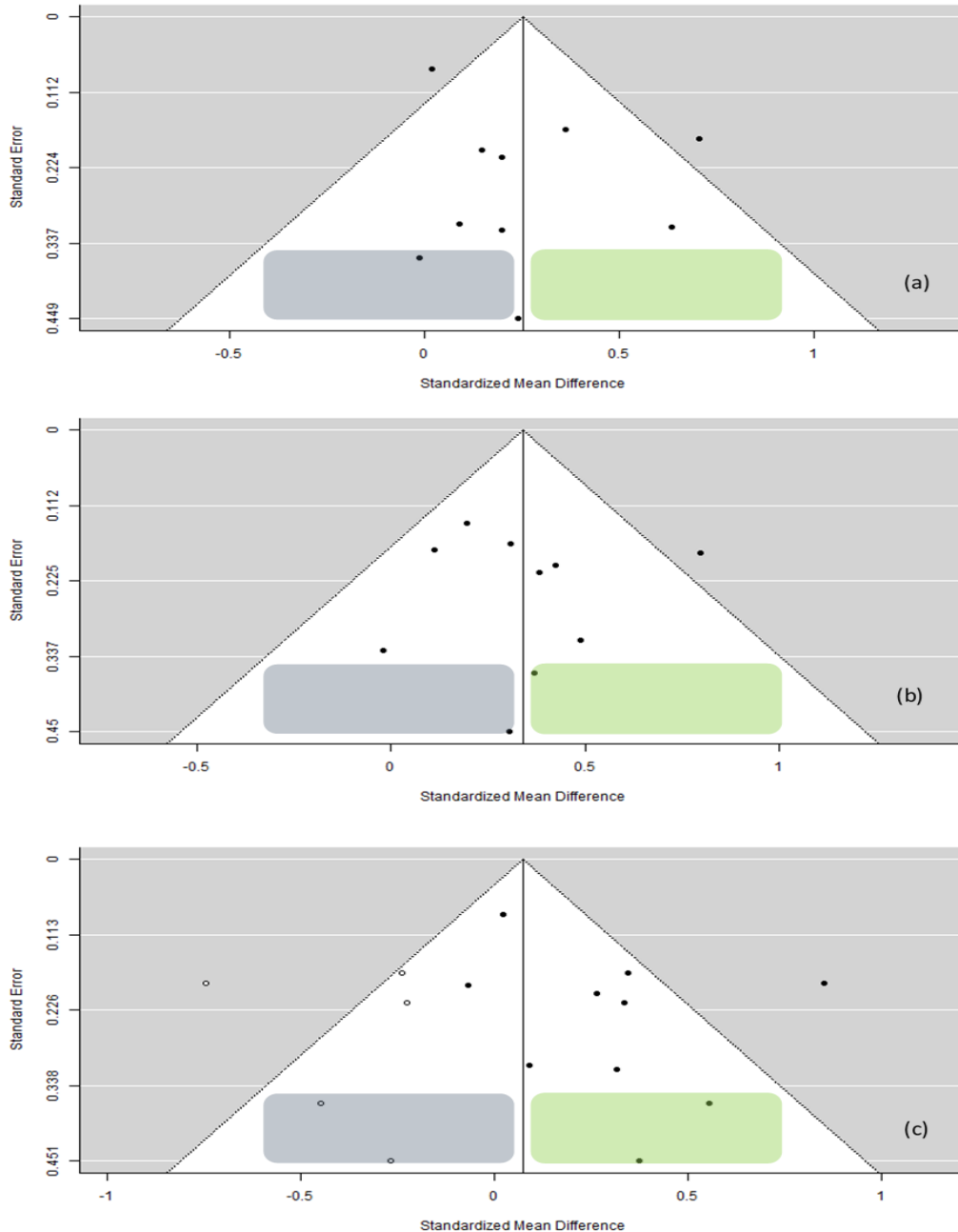
Figure 6. Funnel plot of the standardised mean difference at (a) post-treatment, (b) 6-month
follow-up, and (c) 12-month follow-up. The 95% confidence interval of the expected
distribution of SMD is shown as an inverted "funnel". The blue square on the left indicates
the area where there may be an absence of studies if there is a publication bias. Despite few
studies in the blue square, this is mirrored in the green square on the right.

At 12-month follow-up, Figure 6 indicates the presence of potential publication bias as the literature contains small studies with observed positive effects but lacks those with negative effects. The effect of publication bias was simulated using a trim and fill procedure (Duval & Tweedle, 2000). Trim and fill procedure iteratively removes the most extreme small studies from the side of the funnel plot associated with positive effects, re-computing the effect size at each iteration until the funnel plot is symmetric about the (corrected) effect size. While this adjusts the effect size, it also reduces the variance of the effects. Therefore, the original studies are returned into the analysis, and the procedure imputes a mirror image for each on the side of the funnel plot associated with negative effects. The trim and fill procedure added five studies to the funnel plot at 12 months (hollow dots, Figure 6c). However, only two of these represent small-N studies (blue box, Figure 6c). Rosenthal's (1979) failsafe method indicated that 54 studies would be required to reduce the observed SMD of 0.284 to non-significance. Therefore, despite some evidence of publication bias, the effect remains robust to publication bias.

Conclusions regarding abstinence outcomes

The present meta-analysis sought to assess the efficacy of network-based interventions on alcohol outcomes, relative to non-network-based controls. Abstinence was the most commonly reported outcome and the primary focus of this meta-analysis. The meta-analysis of the standardised mean differences found small but significant advantages of network-based interventions over non-network comparators when increasing levels of abstinence in people with alcohol problems. These findings were found not to change significantly based on identified risks of bias, and were judged to be relatively robust to any potential publication or small study bias (where this was

identified). The design used in some studies allowed for subgroup analyses that identified

greater study-level effects where there was no network involvement at all in the control

group at post-treatment, hinting at an increased efficacy in the control group where

network members are even minimally involved.

Quantity Consumed per Week

Five studies reported measures of quantity of alcohol consumed. This was

typically reported as units per week or, more subjectively, drinks per week. Reported

outcomes of alcohol consumed per week were analysed separately within their respective

follow-up periods. In each case, the variance of the true effect (tau^2) was calculated using

the DerSimonian-Laird estimator using a random effects model, with all studies falling

within the 95% confidence intervals for expected normal values (Appendix 4).

As papers regularly reported outcomes at multiple timepoints, these are reported

separately for post-treatment (4 studies, 110 participants), 6-month (4 studies, 440

participants) and 12-month outcomes (2 studies, 366 participants).

A random effects model was calculated using the generic inverse variance method

at post-treatment, 6 and 12 months. At post-treatment, the random effects model

suggested a weighted average SMD of 0.246 (z = 1.22, p = 0.222) and a 95% confidence

interval of between -0.149 to 0.642. This model demonstrated an acceptable level of

heterogeneity (tau^2 = 0, Higgin's I^2 = 0.0%; χ^2 = 1.35, p = 0.717). At 6-months, the

random effects model suggested a weighted average SMD of 0.119 (z = 0.57, p = 0.569)

and a 95% confidence interval of between -0.291 to 0.528. This model demonstrated an

acceptable level of heterogeneity (tau^2 = 0.771, Higgin's I^2 = 44.8%; χ^2 = 5.44, p = 0.142).

At 12 months, the random effects model suggests a weighted average SMD of 0.795 (z =

1.02, p = 0.306) with a 95% confidence interval of -0.729 to 2.318. This model

demonstrated an unacceptable level of heterogeneity (tau^2 = 1.055, Higgin's I^2 = 85.5%;

χ^2 = 7.03, p = 0.008). The omnibus tests presented in forest plots in Figure 7. Individual

treatment effects are summarised in Appendix 5. None of the time points were significant,

most likely due to small number of studies available, however the effects at each time

point favour the network-based interventions and are of similar magnitude as reported for

abstinence outcomes.
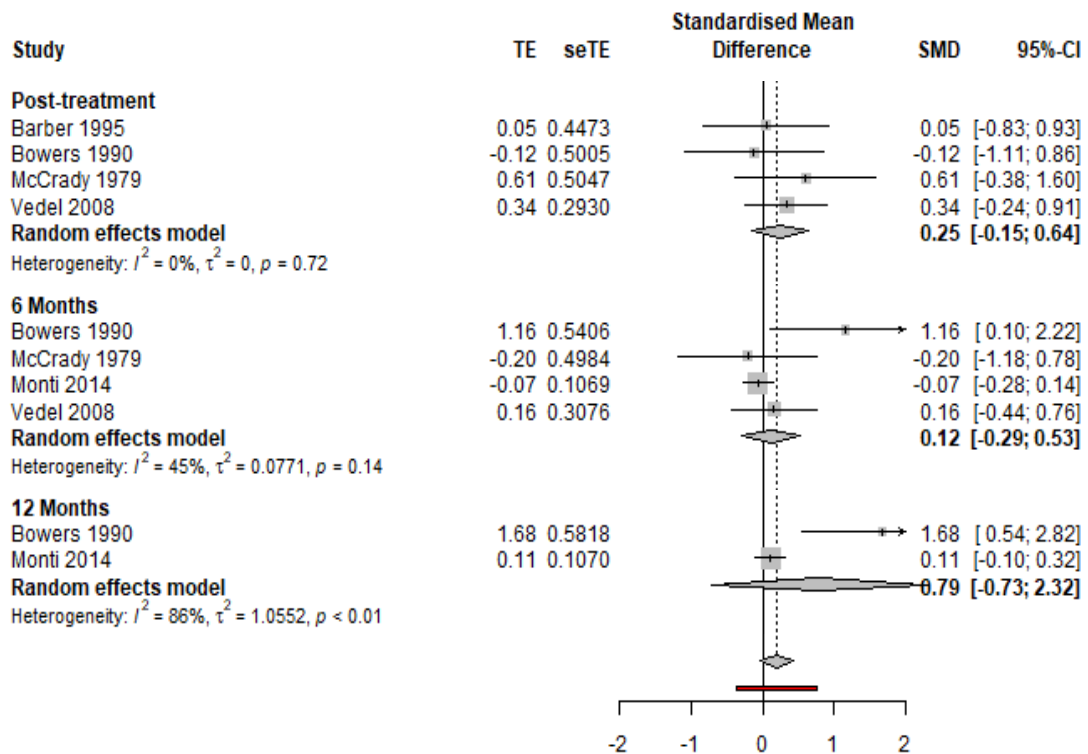
Figure 3. Forest plots for treatment effects as measured by quantity of alcohol consumed per week.

Subgroup analysis, impact of study quality, influential study analysis and publication bias analysis were not conducted due to the limited number of studies reporting this outcome available for analysis.

Drinks per Drinking Day

Drinks per drinking day (DPDD) is often reported alongside percentage of days abstinent; in combination, they can account for intermittent binge drinking and frequent low-level consumption. Reported outcomes of DPDD at 6 and 12 months were analysed together due to the limited number of papers reporting this outcome (N = 5). In the case of Litt 2007, who reported outcomes at both 6 and 12 months, the most conservative figure (6 months) was used. The variance of the true effect (tau^2) was calculated using the DerSimonian-Laird estimator using a random effects model, with all studies falling within the 95% confidence intervals for expected normal values (Appendix 6). The random effects model suggested a weighted average SMD of 0.202 (z = 1.50, p = 0.135) and a 95% confidence interval of between -0.063 to 0.467, indicating a small effect. This model demonstrated a borderline level of heterogeneity (tau^2 = 0.043, Higgin's I^2 = 51.1%; χ^2 = 8.18, p = 0.085). This non-significant model is represented as a forest plot in Figure 8. Individual study effects are presented in Appendix 7. While the effect was not significant, most likely due to small number of studies available, the study effects favour the network-based interventions and are of similar magnitude as reported for abstinence outcomes.

Subgroup analysis, impact of study quality, influential study analysis and publication bias analysis were not conducted due to the limited number of studies reporting this outcome available for analysis.
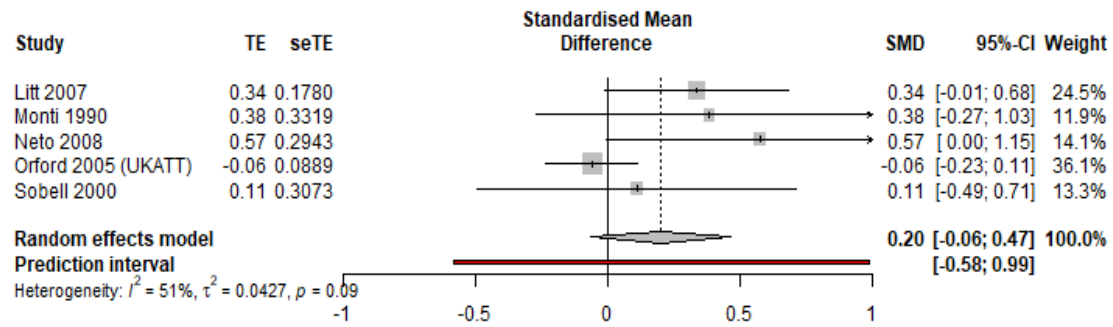
Figure 8. Forest plot for the treatment effect on Drinks Per Drinking Day (DPDD).

Proportion of abstinent participants

Some studies reported outcomes relating to the number of participants who were categorised as abstinent. In most cases, this supplemented other outcomes such as PDA. However, in the case of Natalla 2010, this was the only outcome that could be practicably meta-analysed as other outcomes were reported as change statistics. Measures for categorical outcomes are highly variable between studies; Litt 2007, Natalla 2010 and Neto 2008 categorise abstinence as zero alcohol consumption over the entire research period; McCrady 2009 defines abstinence as zero consumption over the previous 30 days; others have participants qualitatively self-categorise as abstinent or not. Furthermore, some participants may aim for controlled drinking rather than abstinence. As such, the measure itself is highly problematic and inconsistently qualified. On this basis, the results of the analysis must be viewed with caution.

The variance of the true effect (tau^2) was calculated using the DerSimonian-Laird estimator using a random effects model, with all studies falling within the 95% confidence intervals for expected normal values (Appendix 8). At post-treatment, the random effects model suggested a weighted average SMD of 0.090 (z = 0.66, *p* = 0.509) and a 95%

confidence interval of between -0.176 to 0.355. This non-significant model demonstrated

an acceptable level of heterogeneity (tau^2 = 0, Higgin's I^2 = 0.0%; χ^2 = 2.31, p = 0.679).

At 6 months, the random effects model suggested a weight average SMD of 0.468 (z =

4.04, p < 0.001) and a 95% confidence interval of between 0.241 and 0.696. This

significant model demonstrated an acceptable level of heterogeneity (tau^2 = 0, Higgin's

I^2 = 0.0%; χ^2 = 0.91, p = 0.923). At 12 months, the random effects model suggested a

weighted average SMD of 0.324 (z = 1.97, p = 0.048) and a 95% confidence interval of

between -0.002 and 0.645. This significant model demonstrated an acceptable level of

heterogeneity (tau^2 = 0, Higgin's I^2 = 0.0%; χ^2 = 1.56, p = 0.458). The results are displayed

in Figure 9. Individual treatment effects are presented in Appendix 9.

Subgroup analysis, impact of study quality, influential study analysis and

publication bias analysis were not conducted due to the limited number of studies

reporting this outcome available for analysis.

Study	TE	seTE	Standardised Mean Difference	SMD	95%-CI	Weight
Post-Treatment						
Litt 2007	0.25	0.2650		0.25	[-0.27; 0.77]	8.6%
McCrady 1979	0.03	0.4983		0.03	[-0.94; 1.01]	2.4%
McCrady 2009	0.03	0.2242		0.03	[-0.41; 0.47]	12.0%
O'Farrell 1985	0.46	0.4007		0.46	[-0.33; 1.24]	3.7%
Vedel 2008	-0.23	0.3137		-0.23	[-0.84; 0.39]	6.1%
Random effects model				0.09	[-0.18; 0.35]	32.8%
Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.68						
6 Months						
Bowers 1990	0.34	0.6415		0.34	[-0.92; 1.60]	1.5%
Litt 2007	0.34	0.2170		0.34	[-0.09; 0.76]	12.8%
McCrady 1979	0.53	0.5031		0.53	[-0.45; 1.52]	2.4%
Nattala 2010	0.67	0.2947		0.67	[0.09; 1.25]	6.9%
Neto 2008	0.48	0.1683		0.48	[0.15; 0.81]	21.3%
Random effects model				0.47	[0.24; 0.70]	44.8%
Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.92						
12 Months						
Bowers 1990	0.50	0.5208		0.50	[-0.52; 1.52]	2.2%
Litt 2007	0.46	0.2150		0.46	[0.04; 0.88]	13.0%
McCrady 2009	0.03	0.2902		0.03	[-0.54; 0.59]	7.1%
Random effects model				0.32	[0.00; 0.65]	22.4%
Heterogeneity: I^2 = 0%, τ^2 = 0, p = 0.46						

Figure 9. Forest plot for treatment effects as measured by the number of participants categorised as abstinent.

Discussion

The present meta-analysis sought to establish the efficacy of network-based interventions relative to non-network active comparators using randomised controlled designs. It provides a timely update, with the last meta-analysis to focus on network-based treatments for alcohol problems being published by Meads et al. (2007). Ten of the studies included in the present meta-analysis have been published since Meads' review; several of which representing larger scale, high quality RCTs.

Aggregating the effects across 20 studies, intervening in the alcohol usage of over 2,350 participants, the present analysis revealed a small but significant advantage for network-based treatments over controls. Furthermore, these effects continued to be evident with stronger effects at six- and 12-months post-treatment, indicating a lasting benefit of network-based treatments compared to non-network treatments. Specifically, treatments were evidenced to increase the percentage of days that participants were abstinent (PDA). While failing to reach significance – most likely due to the limited number of studies reporting other outcomes – drinks per drinking day and quantity consumed per week also showed promising effects of a similar magnitude and valence to PDA outcomes. Analysis of categorical measures of abstinence (percentage of participants abstinent versus not) revealed moderate and small effect sizes at six and 12 months respectively. However, the way in which "abstinence" was qualified by these studies varied markedly between studies and results should be interpreted with caution. Overall, one can suggest that, taken together, the results offer promise in the development of evidence to support active network involvement in the treatment of alcohol problems.

Across studies, the present meta-analysis assessed a range of interventions including Behavioural Couples Therapy, Behavioural Marital Therapy, Network Support, Social Behaviour Network Therapy, as well as a range of traditionally individually-based therapies enhanced by network involvement. Subgroup analysis revealed observed study-level effects were consistent across intervention type, and consistent regardless of population sex, age, baseline alcohol usage (PDA) or the number of sessions offered. The overall effect of network interventions relative to non-network comparators was comparable at post-treatment to those recently reported by Ariss and Fairbairn (2020) in their review of significant other involvement in substance use treatment, not limited to alcohol usage. However, the present meta-analysis found greater effects sizes at six- and 12-month follow-ups relative to Ariss and Fairbairn's review.

The present findings have important implications for clinical practice. The uptake of family and network approaches among clinicians is reportedly lower than for individually-based treatments, most likely due to client preference, service-related barriers and the continued slow uptake of evidence-based family interventions in routine practice (Copello & Orford, 2002; Haug et al., 2008; McCrady et al., 2011). In the context of clinicians desiring demonstrated effectiveness of interventions (Fals-Stewart & Birchler, 2001), the present meta-analysis provides robust evidence for the effectiveness of network-based interventions, and a rationale for continued research and adoption into clinical practice. Often, network members may not know whether drinking is excessive or choose to avoid the issue which can compound drinking problems (Copello et al., 2002). That additive effects were diminished where networks were minimally involved

in control groups, adds credence to the argument that even basic engagement with family

members and networks can result in improvements in clinical outcomes.

There are some limitations to the present meta-analysis which should be noted;

some pertaining to the limitations of the included studies, and some to the review itself.

Regarding the studies included, there was a high degree of variability across the analysed

studies. At 12 months, the study effects demonstrated more than 50% heterogeneity

suggesting that the presence of uncontrolled or confounding factors may bias the results

at one year follow-up. This was slightly predictable as the author noted significant

variability in terms of control group activity. While for the present meta-analysis, every

effort was made to ensure active controls were included, this was often difficult to qualify

with some control interventions such as case management and outpatient counselling

being comparable to treatment-as-usual approaches. Subgroup analyses further

highlighted stark contrasts between control groups incorporating manualised, structured

cognitive and behavioural treatments, and controls demonstrating less clinical specificity

or theoretical underpinning. This also highlights the current variability and large range of

interventions used in alcohol treatment, not always informed by evidence of

effectiveness.

A second limitation relating to the studies included is that, throughout the meta-

analysis, methodological rigour was highly variable. Assessed using the standard outlined

by Higgins et al. (2011) risk of bias measure, the majority of studies were assessed to

have higher risk of bias. As outlined in Table 4 and Appendix 2, papers often lacked

sufficient detail with regards to randomisation and allocation procedures, and often failed

to blind assessors or account for missing data. While subgroup analyses on measures of

quality found no significant differences between outcomes of papers deemed to have low

risk versus any risk, the present author noted that they were harsher than Ariss and

Fairbairn (2020) in their assessment of the same papers. Despite this, subgroup analyses

found significant differences based on the structure and theoretical underpinning of the

control group interventions indicating that design-specific confounds may result in

overstated effect sizes. Taken together, the high variability in study design and

methodological rigour has the potential to undermine the conclusions presented.

With regards to the review itself, it is limited by the fact that the literature search

yielded comparatively few non-family intervention studies, despite seeking to investigate

broadly the effects of network-based interventions, including both family and non-family-

based network involvement. This is likely to be reflective of the literature which places

greater emphasis on family-based therapies (Copello et al., 2002). While subgroup

analyses revealed no significant differences between family- and non-family intervention

outcomes, this may be due to the limited number of non-family-based studies available.

Furthermore, while the present meta-analysis judged AA and 12-step

interventions to be beyond the remit of the paper, it was not possible to completely

discount the impact of AA as a source of network support. To address this in part,

subgroup analyses explored explicitly stated involvement with AA. A number of studies

took different approaches to AA involvement. Litt (2007) was the only paper to actively

encourage AA involvement exclusively in the experimental arm, while AA is encouraged

for all participants in O'Farrell 1985 and Neto 2008, and is documented in Schumm 2014.

Other papers make no mention of AA attendance, while McCrady 1986 made AA

attendance an exclusion criterion. AA represents a significant source of network support

(Kelly et al., 2020), and where SBNT attempts to bolster participants' abstinent networks, AA serves a very similar function. Subgroup analysis revealed a significant advantage in the studies which promoted AA involvement at 12 months. This may speculatively reflect longer-term benefits of sustained involvement after the period of acute treatment has concluded, and is an important focus for future research.

Recommendations for Future Literature

The author noted considerable methodological variation and risk of bias throughout the literature. This is likely to have contributed to higher levels of heterogeneity (i.e., 12-month follow-up Percentage Days Abstinence; PDA). Researchers assessing the efficacy of network-based interventions would benefit from using standardised outcomes such as PDA, alongside Drinks per Drinking Day (DPDD). As referenced throughout the paper, the outcomes reported across the literature are highly variable. While the majority of papers reported alcohol outcomes with relative consistency (using PDA), there remained a number of exceptions. Neto 2008 reported their figure as cumulative abstinent days across the 180-day period, while Walitzer 2004 similarly reported the mean number of days abstinent or light drinking. Hartmann 2020, rather than using self-report measures, used breathalyser tests. This variability may contribute to the overall heterogeneity in study treatment effects. Similarly, without also reporting DPDD, studies may not capture participants' drinking patterns fully as participants may be prone to binge drinking on rare occasions (which would yield high PDA scores). Despite this, only four studies reported DPDD in tandem, which would typically enrichen outcome data. Furthermore, whilst it is important to focus on alcohol

consumption-related outcomes for the alcohol user, there may be additional benefits to social network interventions that relate to the possible reduction of stress and psychological symptoms for those network members affected (Ray, Mertens & Wiesner, 2009; Newton, Shepherd, Orford, & Copello, 2016) and actively involved in the interventions (e.g., families) which future research may need to measure and assess in addition to drinking outcomes (Orford, Templeton, Velleman, & Copello, 2005).

In terms of study design, the literature would benefit from future studies using active non-network-based comparators using manualised interventions with an existing evidence-base and widespread clinical application. The presence of non-specific controls, or those without robust clinical evidence-bases may serve to overestimate treatment effects, as highlighted in the subgroup analyses (Table 7). By contrast, authors should consider the impact of even minimal network involvement in the control which may inadvertently confound the design and weaken comparative treatment effect of the network intervention.

Finally, future papers should aim to ensure that treatment allocation is concealed from participants until treatment. Lack of concealment can lead to selective enrolment or non-random allocation by clinicians, exaggerating effect sizes on average by 18% (Higgins et al., 2011). Furthermore, efforts should be made to blind assessors to treatment conditions as was often not the case in the literature reviewed. Incomplete datasets should be accounted for and reported appropriately, as the reviewed studies frequently reported dropouts which were not accounted for, where relapses were assumed, or data imputed using methods at risk of bias. By enhancing methodological rigour and consistency between studies, the evidence base will benefit from greater trust from clinicians.

Conclusions

The present meta-analysis sought to ascertain the relative efficacy of network-based interventions as compared to active non-network-based controls. On the most consistently used outcome measures (Percentage Days Abstinence; PDA), network-based interventions demonstrated a small but significant advantage over controls at all timepoints. Though not significant, effects of similar magnitude were observed on measures of drinks per drinking day, and alcohol consumed per week. However, there remains within the methodologies of the selected studies considerable variation in outcome measures, control choice and application, and study quality.

References

Ariss, T., & Fairbairn, C. E. (2020). The effect of significant other involvement in treatment for substance use disorders: A meta-analysis. *Journal of Consulting and Clinical Psychology. 88*(6), 526–540.

Banks, B. D., Mao, I. L., & Walter, J. P. (1985). Robustness of the restricted maximum likelihood estimator derived under normality as applied to data with skewed distributions. *Journal of Dairy Science*, *68*(7), 1785–1792.

Barber, J. G., & Crisp, B. R. (1995). Social support and prevention of relapse following treatment for alcohol abuse. *Research on Social Work Practice, 5*(3), 283–296.

Baujat, B., Mahe, C., Pignon, J.-P., & Hill, C. (2002). A graphical method for exploring heterogeneity in meta-analyses: Application to a meta-analysis of 65 trials. *Statistics in Medicine, 21*(18), 2641–2652.

Bonett, D. G. (2002). Sample size requirements for testing and estimating coefficient alpha. *Journal of Educational and Behavioral Statistics*, *27*(4), 335–340.

Bonett, D. G. (2010). Varying coefficient meta-analytic methods for alpha reliability. *Psychological Methods, 15*, 368–385.

Borenstein, M. (Ed.). (2009). Complex data structures. In *Introduction to meta-analysis.* Chichester, U.K: John Wiley & Sons.

Bowers, T. G., & Al-Redha, M. R. (1990). A comparison of outcome with group/marital and standard/individual therapies with alcoholics. *Journal of Studies on Alcohol, 51*(4), 301-309.

Burns, P. B., Rohrich, R. J., & Chung, K. C. (2011). The levels of evidence and their role in evidence-based medicine. *Plastic and Reconstructive Surgery, 128*(1), 305–310.

Chan, J. G. (2003). An examination of family-involved approaches to alcoholism treatment. *The Family Journal, 11*(2), 129–138.

Copello, A., & Orford, J. (2002). Addiction and the family: is it time for services to take notice of the evidence? *Addiction, 97*(11), 1361–1363.

Copello, A., Orford, J., Hodgson, R., Tober, G., Barrett, C., & UKATT Research Team (2002). Social behaviour and network therapy: basic principles and early experiences. *Addictive Behaviors, 27*(3), 345–366.

Copello, A. G., Velleman, R. D., & Templeton, L. J. (2005). Family interventions in the treatment of alcohol and drug problems. *Drug and Alcohol Review, 24*(4), 369–385.

de Maio, R. (1989). Integrating traditional alcoholic treatment programs and family-systems therapy. *Family Systems Medicine, 7*(3), 274.

DerSimonian, R., & Laird, N. (1986). Meta-analysis in clinical trials. *Controlled Clinical Trials*, *7*(3), 177–188.

Doi, S. A. R., & Thalib, L. (2008). A quality-effects model for meta-analysis. *Epidemiology*, *19*(1), 94–100.

Duval, S., & Tweedie, R. (2000a). Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, *56*(2), 455–463.

Duval, Sue, & Tweedie, R. (2000b). A nonparametric 'trim and fill' method of accounting for publication bias in meta-analysis. *Journal of the American Statistical Association*, *95*(449), 89–98.

Edwards, M. E., & Steinglass, P. (1995). Family therapy treatment outcomes for
alcoholism. *Journal of Marital and Family Therapy, 21*(4), 475–509.

Fals-Stewart, W., & Birchler, G. R. (2001). A national survey of the use of couples
therapy in substance abuse treatment. *Journal of Substance Abuse Treatment,
20*(4), 277–283.

Galanter, M. (1993). Network therapy for addiction: a model for office practice. *The
American Journal of Psychiatry, 150*(1), 28–36.

Gilligan, C., Wolfenden, L., Foxcroft, D. R., Williams, A. J., Kingsland, M., Hodder, R.
K., . . . Wiggers, J. (2019). Family-based prevention programmes for alcohol use
in young people. *The Cochrane Database of Systematic Reviews, 3*(3),
CD012287-CD012287. doi:10.1002/14651858.CD012287.pub2

Guidi, J., Brakemeier, E. L., Bockting, C. L., Cosci, F., Cuijpers, P., Jarrett, R. B., . . .
Rafanelli, C. (2018). Methodological recommendations for trials of psychological
interventions. *Psychotherapy and Psychosomatics, 87*(5), 276–284.

Hartmann, M., Datta, S., Browne, E. N., Appiah, P., Banay, R., Caetano, V., . . .
Srinivasan, K. (2020). A combined behavioral economics and cognitive
behavioral therapy intervention to reduce alcohol use and intimate partner
violence among couples in Bengaluru, India: Results of a pilot study. *Journal of
Interpersonal Violence*, 886260519898431. doi:10.1177/0886260519898431

Haug, N. A., Shopshire, M., Tajima, B., Gruber, V., & Guydish, J. (2008). Adoption of
evidence-based practices among substance abuse treatment providers. *Journal of
Drug Education, 38*(2), 181–192.

Higgins, J. P. T., Altman, D. G., Gotzsche, P. C., Juni, P., Moher, D., Oxman, A. D., …
Cochrane Statistical Methods Group. (2011). The Cochrane Collaboration's tool
for assessing risk of bias in randomised trials. *BMJ*, *343*(oct18 2), d5928–d5928.

Higgins, J. P., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M. J., & Welch, V.
A. (2019). *Cochrane handbook for systematic reviews of interventions*: John
Wiley & Sons.

Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring
inconsistency in meta-analyses. *BMJ, 327*(7414), 557–560.

Kelly, J. F., Humphreys, K., & Ferri, M. (2020). Alcoholics Anonymous and other 12-
step programs for alcohol use disorder. *Cochrane Database of Systematic
Reviews,3*. doi:10.1002/14651858.CD012880.pub2

Kim, S. Y., Park, J. E., Lee, Y. J., Seo, H.-J., Sheen, S.-S., Hahn, S., … Son, H.-J. (2013).
Testing a tool for assessing the risk of bias for non-randomized studies showed
moderate reliability and promising validity. *Journal of Clinical Epidemiology*,
66(4), 408–414.

Lam, W. K., Fals-Stewart, W., & Kelley, M. L. (2009). Parent training with behavioral
couples therapy for fathers' alcohol abuse: Effects on substance use, parental
relationship, parenting, and CPS involvement. *Child Maltreatment, 14*(3), 243–
254.

Larimer, M. E., Palmer, R. S., & Marlatt, G. A. (1999). Relapse prevention: An overview
of Marlatt's cognitive-behavioral model. *Alcohol Research & Health, 23*(2), 151–
160.

Litt, M. D., Kadden, R. M., Kabela-Cormier, E., & Petry, N. (2007). Changing network
support for drinking: Initial findings from the network support project. *Journal of
Consulting and Clinical Psychology, 75*(4), 542–555.

Longabaugh, R., Wirtz, P. W., Beattie, M. C., Noel, N., & Stout, R. (1995). Matching
treatment focus to patient social investment and support: 18-month follow-up
results. *Journal of Consulting and Clinical Psychology, 63*(2), 296–307.

McCrady, B. S., Epstein, E. E., Cook, S., Jensen, N. K., & Ladd, B. O. (2011). What do
women want? Alcohol treatment choices, treatment entry and retention.
Psychology of Addictive Behaviors, 25(3), 521–529.

McCrady, B. S., Epstein, E. E., Cook, S., Jensen, N., & Hildebrandt, T. (2009). A
randomized trial of individual and couple behavioral alcohol treatment for
women. *Journal of Consulting and Clinical Psychology, 77*(2), 243–256.

McCrady, B. S., Noel, N. E., & Abrams, D. B. (1986). Comparative effectiveness of three
types of spouse involvement in outpatient behavioral alcoholism treatment.
Journal of Studies on Alcohol, 47(6), 459–467.

McCrady, B. S., Paolino Jr, T. J., Longabough, R., & Rossi, J. (1979). Effects of joint
hospital admission and couples treatment for hospitalized alcoholics: A pilot
study. *Addictive Behaviors, 4*(2), 155–165.

Meads, C., Ting, S., Dretzke, J., & Bayliss, S. (2007). A systematic review of the clinical
and cost-effectiveness of psychological therapy involving family and friends in
alcohol misuse or dependence. *Database of Abstracts of Reviews of Effects
(DARE): Quality-assessed Reviews [Internet].*

Meisel, M. K., Clifton, A. D., MacKillop, J., & Goodie, A. S. (2015). A social network
analysis approach to alcohol use and co-occurring addictive behavior in young
adults. *Addictive Behaviors, 51*, 72–79.

Miller, W. R., & Rollnick, S. (2002). *Motivational interviewing: Preparing people for
change* (2nd ed.). New York: Guilford.

Miller, W. R., & Wilbourne, P. L. (2002). Mesa Grande: a methodological analysis of
clinical trials of treatments for alcohol use disorders. *Addiction, 97*(3), 265–277.

Monti, P. M., Abrams, D. B., Binkoff, J. A., Zwick, W. R., Liepman, M. R., Nirenberg,
T. D., & Rohsenow, D. J. (1990). Communication skills training, communication
skills training with family and cognitive behavioral mood management training
for alcoholics. *Journal of Studies on Alcohol, 51*(3), 263–270.

Monti, P. M., Colby, S. M., Mastroleo, N. R., Barnett, N. P., Gwaltney, C. J., Apodaca,
T. R., . . . Cioffi, W. G. (2014). Individual versus significant-other-enhanced brief
motivational intervention for alcohol in emergency care. *Journal of Consulting
and Clinical Psychology, 82*(6), 936–948.

National Institute for Health and Care Excellence. (2011). *Alcohol use disorders: The
NICE guideline on the diagnosis, assessment and management of harmful
drinking and alcohol dependence*. (1904671268).

Nattala, P., Leung, K. S., Nagarajaiah, & Murthy, P. (2010). Family member involvement
in relapse prevention improves alcohol dependence outcomes: A prospective
study at an addiction treatment facility in India. *Journal of Studies on Alcohol and
Drugs, 71*(4), 581–587.

Neto, D., Lambaz, R., Aguiar, P., & Chick, J. (2008). Effectiveness of sequential combined treatment in comparison with treatment as usual in preventing relapse in alcohol dependence. *Alcohol and Alcoholism, 43*(6), 661–668.

New York State Office of the Attorney General. (2010). *The New York State Attorney General Andrew M. Cuomo Announces Charges Against Former UB Researcher For Hiring Actors To Testify During Misconduct Hearing And Attempting To Siphon $4 Million In Taxpayer Funds. February 2010.* Retrieved at https://ag.ny.gov/press-release/2010/new-york-state-attorney-general-andrew-m-cuomo-announces-charges-against-former

Newton, E., Shepherd, N., Orford, J., & Copello, A. (2016). Could the Substance Misuse of a Relative be an Important Factor for Those Seeking Help for Anxiety and Depression? A Preliminary Prevalence Study within Improving Access to Psychological Therapies (IAPT). *Behavioural and Cognitive Psychotherapy*, *44*(6), 723–729.

Nutt, D. J., King, L. A., & Phillips, L. D. (2010). Drug harms in the UK: a multicriteria decision analysis. *The Lancet, 376*(9752), 1558–1565.

O'Farrell, T. J., Cutter, H. S., & Floyd, F. J. (1985). Evaluating behavioral marital therapy for male alcoholics: Effects on marital adjustment and communication from before to after treatment. *Behavior Therapy, 16*(2), 147–167.

Orford, J. (2005). Effectiveness of treatment for alcohol problems: Findings of the randomised UK Alcohol Treatment Trial (UKATT). *BMJ (Clinical research ed.), 331*(7516), 541–544.

Orford, J., Templeton, L., Velleman, R., & Copello, A. (2005). Family members of relatives with alcohol, drug and gambling problems: a set of standardized questionnaires for assessing stress, coping and strain. *Addiction, 100*(11), 1611– 1624.

Peterson, R. A., & Brown, S. P. (2005). On the use of beta coefficients in meta-analysis. *Journal of Applied Psychology, 90*(1), 175–181.

Powers, M. B., Vedel, E., & Emmelkamp, P. M. (2008). Behavioral couples therapy (BCT) for alcohol and drug use disorders: A meta-analysis. *Clinical Psychology Review, 28*(6), 952–962.

Pryce, R., Buykx, P., Gray, L., Stone, T., Drummond, C., & Brennan, A. (2017). *Estimates of alcohol dependence in England based on APMS 2014, including estimates of children living in a household with an adult with alcohol dependence: Prevalence, trends and amenability to treatment.* London: Public Health England.

Ray, G. T., Mertens, J. R., & Weisner, C. (2009). Family members of people with alcohol or drug dependence: Health problems and medical cost compared to family members of people with diabetes and asthma. *Addiction*, *104*(2), 203–214.

Room, R., Babor, T., & Rehm, J. (2005). Alcohol and public health. *The Lancet, 365*(9458), 519–530.

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, *86*(3), 638–641.

Rupinski, M. T., & Dunlap, W. P. (1996). Approximating Pearson product-moment correlations from Kendall's tau and Spearman's rho. *Educational and Psychological Measurement, 56*(3), 419–429.

Schumm, J. A., O'Farrell, T. J., Kahler, C. W., Murphy, M. M., & Muchowski, P. (2014).
A randomized clinical trial of behavioral couples therapy versus individually
based treatment for women with alcohol dependence. *Journal of Consulting and
Clinical Psychology, 82*(6), 993–1004.

Slesnick, N., & Zhang, J. (2016). Family systems therapy for substance-using mothers
and their 8- to 16-year-old children. *Psychology of Addictive Behaviors, 30*(6),
619–629.

Sobell, M. B., Sobell, L. C., & Leo, G. I. (2000). Does enhanced social support improve
outcomes for problem drinkers in guided self-change treatment? *Journal of
Behavior Therapy and Experimental Psychiatry, 31*(1), 41–54.

Templeton, L., Velleman, R., & Russell, C. (2010). Psychological interventions with
families of alcohol misusers: A systematic review. *Addiction Research & Theory,
18*(6), 616–648.

Vedel, E., Emmelkamp, P. M., & Schippers, G. M. (2008). Individual cognitive-
behavioral therapy and behavioral couples therapy in alcohol use disorder: a
comparative evaluation in community-based addiction treatment centers.
Psychotherapy and Psychosomatics, 77(5), 280–288.

Walitzer, K. S., & Dermen, K. H. (2004). Alcohol-focused spouse involvement and
behavioral couples therapy: Evaluation of enhancements to drinking reduction
treatment for male problem drinkers. *Journal of Consulting and Clinical
Psychology, 72*(6), 944–955.

Williams, R., Alexander, G., Armstrong, I., Baker, A., Bhala, N., Camps-Walsh, G., . . .
Dhawan, A. (2018). Disease burden and costs from excess alcohol consumption,

obesity, and viral hepatitis: Fourth report of the Lancet Standing Commission on

Liver Disease in the UK. *The Lancet, 391*(10125), 1097–1107.

Zywiak, W. H., Longabaugh, R., & Wirtz, P. W. (2002). Decomposing the relationships

between pretreatment social network characteristics and alcohol treatment

outcome. *Journal of Studies on Alcohol, 63*(1), 114–121.

Empirical Research Paper: The impact of social network contact on recovery from alcohol problems: a mixed methods pilot case series including experience sampling methodology.

Word Count: 7,019

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Abstract

Background. Alcohol use disorders have significant health implications for the general population, with evidence suggesting that alcohol use increased in the UK during the Covid-19 pandemic. Alcohol use has been linked to the behaviours, attitudes and compositions of the alcohol user's social networks; however, the mechanisms are not well understood. The present study investigated this question using a mixed-methods approach.

Method. The present case series recruited 6 participants in treatment for alcohol use disorders. The study explored the composition, behaviours and attitudes of individuals within their networks. Using a smartphone app, participants recorded in real time ongoing temptation to drink, confidence to refrain, and contact with network members. Qualitative interviews explored perceived links between network contacts and recovery from alcohol problems.

Analysis. Descriptive statistics were used to present participants' social networks, and assess the viability of the method. Patterns of temptation and confidence over time are presented visually. Thematic analysis extracted themes from participants lived experiences.

Results. Participants' networks were broadly similar in composition to those found in previous studies. Mean response rate on the app was 81%, in line with previous studies. Thematic analysis details the way in which networks can actively and passively increase temptation or support abstinence. This highlighted the role of network awareness, motivation, availability and relationship quality in supporting the participants' change.

Discussion. The results of the present case series explicate the link between social network composition and recovery from alcohol problems. The effective methodology provides rationale for a larger study incorporating mixed effects analyses.

*I'd had bereavement counselling on a Wednesday and it- it did knock
me back quite a bit - I felt really down again. I was tempted to drink – I
didn't, which was fortunate; managed to get through it but I stayed in
bed all day on the Thursday. And then on the Friday morning my friend
came around about 8:30 and we went out for a walk had a good talk
and then I spoke to everyone else as well that day. I got a telling off for
not ringing them on the Thursday to say I was having a really bad day
because they would have come round. And then obviously on Friday the
network kicked in – the old girls network kicked in and that was it. They
just talked about it, talked about what was wrong, how far I'd come,
encouraged me really to keep going, to think about the positives of how
far I've come and not to dwell on any negative thoughts so- and it
worked, yeah.... And I know now from that- from that last blip, that
Wednesday, Thursday- if I do feel like that, it's just pick up the phone to
one of them. They just said "for God's sake, just pick up the phone."*

Introduction

In 2018, there were 595,131 adults in the UK with alcohol dependency, of which

47% had moderate to severe dependency (Williams et al., 2018), and in 2014 an estimated

41.2% of alcohol dependent people intended on reducing their alcohol consumption in

the near future (Pryce et al., 2017). Heavy alcohol use has been linked to more than 60

medical conditions including oesophageal cancer, liver cancer, haemorrhagic stroke, liver

cirrhosis and epilepsy (Room et al., 2005). It is reported that alcohol causes more harm

than illicit drugs such as crack cocaine and heroin (Nutt et al., 2010). Furthermore, early

evidence is emerging of the impact of Covid-19 lockdown on patterns of alcohol use.

Using a sample of 2,010 UK adults, Alcohol Change UK (2020) reported that 21% of

respondents drank on more days in the first two weeks of lockdown than usual, with 13%

drinking more per day. Similarly, Public Health England (2021) reported observable

increases in the prevalence of increasing and higher risk drinking in March 2020 which

continued into 2021 while the Office for National Statistics (2021) reported a 19.6%

increase in alcohol-specific deaths in England and Wales in 2020 relative to 2019. In the USA, French, Mortensen, and Timming (2020) reported significant increases in alcohol consumption across the first and second waves of the pandemic while Pollard, Tucker, and Green (2020) reported a 14% increase in alcohol consumption in 2020 relative to 2019. This emerging evidence is suggestive of a marked shift in drinking behaviours during the Covid-19 pandemic.

Marlatt and Gordon's (1985) Relapse Prevention model of alcohol use, applied to those attempting to abstain from or reduce drinking, is based on social-cognitive psychology and posits that one's self-efficacy in abstaining and effective coping during high-risk situations predict relapse. When an individual experiences a decrease in self-efficacy, relapse is more likely (Marlatt & Gordon, 1985; Witkiewitz & Marlatt, 2004). In the context of their model, high risk situations include negative and positive affect, both positive and negative interpersonal situations (e.g., conflicts and celebrations) and social pressure. One significant predictor or relapse into alcohol use is the quality and quantity of social support (Witkiewitz & Marlatt, 2004). Peirce, Frone, Russell, Cooper, and Mudar (2000) reported that increased actual social contact was associated with changes in perceived social support, subsequent reduction in depression and later alcohol intake.

Highlighting the role of social networks, several studies have applied social network analysis to substance use including alcohol consumption. Meisel et al. (2015) reported that, among undergraduates, high-risk drinkers perceived those in their social networks to drink more than low risk and abstinent participants. Furthermore, Zywiak et al. (2002) reported a positive association between the percentage of abstainers and

recovering alcoholics in one's network and prognosis following treatment for alcohol
abuse. While there is therefore an association between network characteristics and
drinking behaviour, the direction of association is unclear. A number of studies
investigating this question in illicit drug use have produced varying results. Latkin,
Knowlton, Hoover, and Mandell (1999) posited that individuals are influenced by the
behaviour of their network (influence hypothesis), while others posit that individuals
actively choose their network members who display qualities and behaviours similar to
their own (selection hypothesis) (Buchanan & Latkin, 2008; Bullers, Cooper, & Russell,
2001). Overall, the literature suggests that the influence is, in fact, bidirectional (Bohnert,
Bradshaw, & Latkin, 2009; Kirke, 2004; McMillan, Felmlee, & Osgood, 2018) although
this has not been fully explored with respect to problematic alcohol use.

Despite evidence suggesting an association between social networks and
substance use, there are gaps in the literature. Many of the studies are cross-sectional, or
look at macro-level behaviour patterns over sparse timeframes, undermining the ability
to make strong causal inferences about the mechanisms involved from the results
reported. When sampling months or years apart, external causation can undermine causal
inferences (Bohnert et al., 2009); this difficulty can be mitigated with temporally high-
frequency measurement (Block, Heathcote, & Heyes, 2018). Furthermore, specific
contacts with individual network members are largely ignored in the literature, which
focuses on network composition and later outcomes rather than the immediate impact.
Finally, much of the literature focuses on illegal drug use or alcohol use in adolescents,
rather than attempts towards abstinence in adults with alcohol use disorders. As it is well
documented that social networks and social support influence recovery from alcohol

problems, understanding the precise mechanisms by which social contact impacts on
recovery efforts will help to inform theory, interventions and ultimately optimise
recovery.

In order to address these gaps, the present case series was designed using a mixed
method approach incorporating Experience Sampling Methodology (ESM; sometimes
called Ecological Momentary Assessment, EMA) and qualitative interviews using a
sample of individuals in treatment for alcohol problems. ESM comprises multiple
assessments over time of individuals' current state in real-world environments, rather than
relying on retrospective reporting which can be prone to bias (Trull & Ebner-Priemer,
2009). The ESM was facilitated through a custom-made smartphone app, as smartphones
have been previously noted as an unobtrusive way to collect momentary state data
(Rickard, Arjmand, Bakker, & Seabrook, 2016). The smartphone app was designed to
monitor on a daily basis participants' contact with the social network and its observed
(quantitative) and perceived (qualitative) association with confidence in maintenance of
the treatment goal, actual behavioural maintenance, and temptation to consume more;
factors associated with relapse (Marlatt & Gordon, 1985). This methodology aimed to
elucidate the mechanisms linking social network characteristics to temptation to use
alcohol by focusing on actual contact with network members. ESM has been applied to
drug and alcohol use in the past to identify factors associated with relapse (Shiffman,
2009). However, the majority of the published studies have focused exclusively on mood
patterns throughout the day or week, and their association with alcohol use (Armeli, Todd,
Conner, & Tennen, 2008; Cooney et al., 2009; Hussong, Hicks, Levy, & Curran, 2001;
Swendsen et al., 2000). None, to the author's knowledge, have assessed the ongoing

impact of contact with the social network on abstinence or planned reduction in consumption using frequent measurement as used in ESM.

The present case series is a pilot study for a larger trial reporting on preliminary analyses. However, given the ongoing pandemic, the impact on people's social network contact due to government restrictions, and reported changes in alcohol consumption, the present paper also provides a critical insight into the link between social networks and alcohol use during an unprecedented time.

Hypothesis

The overall aim of the study was to develop and test a novel methodology in a pilot phase, building towards a larger study. Given the impact of the pandemic and government restrictions upon recruitment during the study period, this report focuses on proof of feasibility of the methods and sample description, as well as qualitative exploration of the key concepts related to social contact and alcohol consumption. In line with previous literature (Meisel et al., 2015; Zywiak et al., 2002), the program of work was guided by the hypothesis that when in contact with network members who are accepting or encouraging of alcohol usage, or who themselves drink, participants will experience greater temptation to drink and less confidence in their recovery. Conversely, contact with those who support abstinence, or are themselves abstinent, may decrease temptation and increase confidence. Hypotheses were not posited regarding the direction of causality at this stage. Furthermore, it was hypothesised that social contact would be protective overall (Peirce et al., 2000).

Method

Ethical Approval

The study was submitted for ethical review at the Black Country Research Ethics Committee (Reference: 20/WM/0096) wherein Health Research Authority (HRA) and Health and Care Research Wales (HCRA) approval were given.

Participants

Participants were individuals recruited from an addiction service in the UK. They were required to be at least 18 years old and engaging with the addiction service with a stated goal of either reducing their alcohol consumption or remaining abstinent. It was necessary that participants owned a smartphone or tablet capable of supporting Android or IOS applications. Participants were required to be able to identify and have regular contact with people in their network. Recruitment was done remotely through the addiction service staff. At the time of the present study, face-to-face recruitment at the local clinic was not possible due to Covid-19 restrictions and hence the original design was adapted for remote recruitment.

Measures

Participants were assessed using the Important People Drug and Alcohol interview (IPDA; Appendix 1) (Zywiak et al., 2009). For the purposes of the present

study, the measure was adapted so that participants were asked to name "*people you have spent the most time with in the past 3 months, and are likely to see in the next 2 weeks. These people may be anyone over the age of 12 years old, and may include family members, friends, drinking buddies, people from work, club members, or anyone that you interact with, regardless of whether or not you like them*." Participants then scored their network members on variables relating to the frequency of contact, importance of the individual to them, general supportiveness, alcohol use and frequency, attitudes relating to the participant's drinking, and reaction to their seeking treatment. The IPDA was originally adapted from the Important People and Activities (IPA) interview (Longabaugh, Beattie, Noel, Stout, & Malloy, 1993). The IPA itself benefits from substantial research and use in large-scale multisite randomised clinical trials such as Project MATCH (MATCH Research Group, 1998), Project COMBINE (COMBINE Study Research Group, 2003) and the United Kingdom Alcohol Treatment Trial (UKATT Research Team, 2001). Of note, the drink-related attitudes, attitudes towards treatment, and drinking behaviour of a participant's network, as scored on the IPA, have been shown to correlate with the percentage of days a participant is abstinent (Longabaugh, Wirtz, Zywiak, & O'Malley, 2010). In the present study, the IPDA was scored in accordance with the scoring system outlined in the COMBINE study supplementary information (Longabaugh et al., 2010) which converts the ordinal ratings into categorical data (e.g., categorising contacts as encouraging or discouraging of alcohol usage). Participants were further assessed using the Beck Anxiety Inventory (BAI) (Beck, Epstein, Brown, & Steer, 1988) and Beck Depression Inventory-II (BDI-II) (Beck, Steer, & Brown, 1996) to ascertain whether the sample was representative of treatment-matched populations.
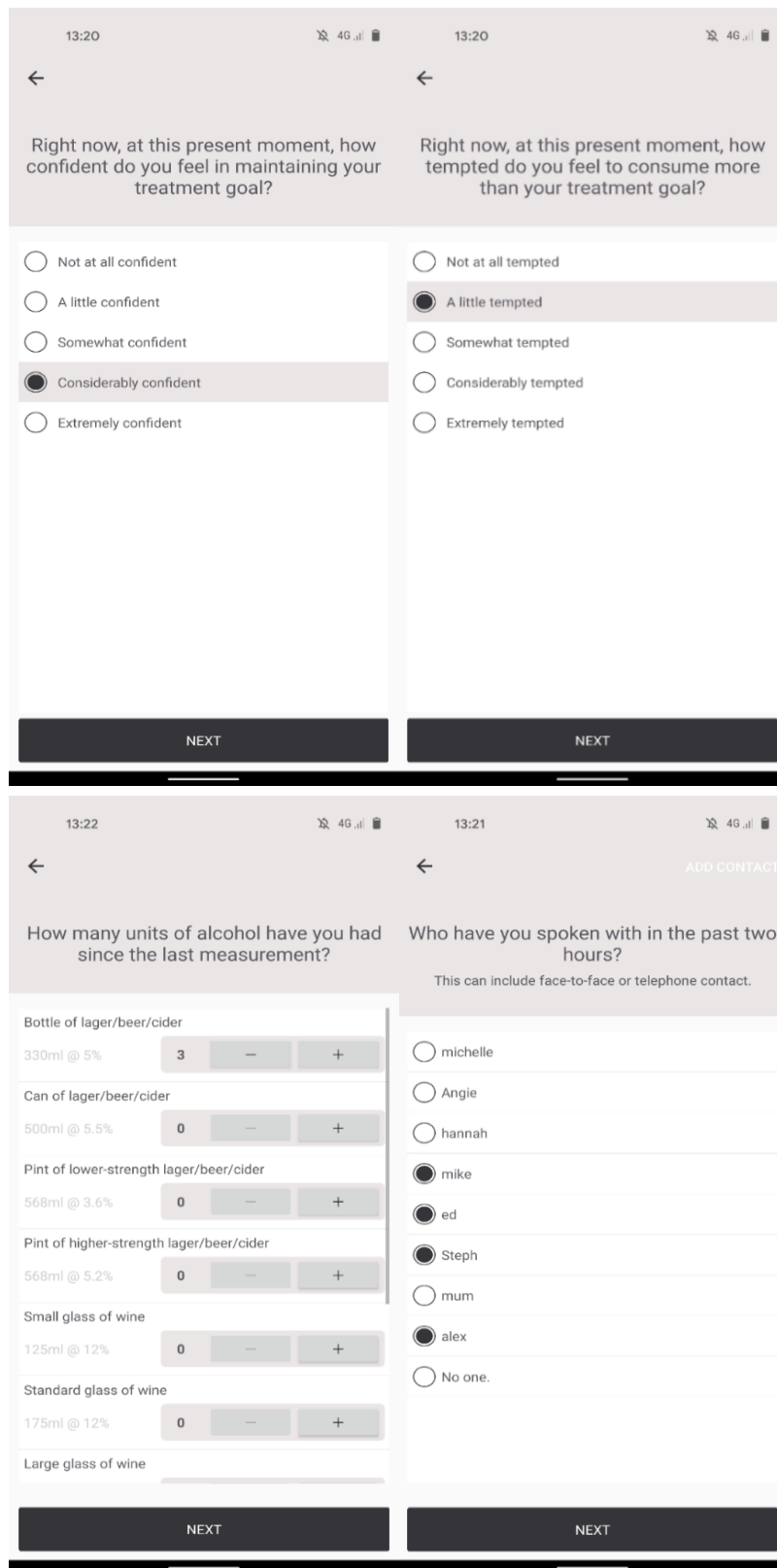
Figure 1. SoNAR App screenshots

Social Network and Alcohol Recovery (SoNAR) App

The study aimed to monitor participants' momentary confidence to refrain from alcohol-use and temptation to drink twice-daily. To facilitate this, a mobile phone app (SoNAR app) was developed and made available on the Android Play Store and IOS App Store. The app asked participants: "*Right now, at this present moment, how confident do you feel in maintaining your treatment goal?*" and "*Right now, at this present moment, how tempted do you feel to consume more than your treatment goal?*". Participants selected responses to each question from a list of five: "*not at all*", "*a little*", "*somewhat*", "*considerably*", and "*extremely*". Participants selected from a list of names (identified in the IPDA as described and entered into the app) who they had "*spoken with in the past two hours*". Contact could include face-to-face, telephone or online videocall. Participants then indicated how much alcohol they had consumed since their last measurement, and whether this was on track to meet their treatment goal (Figure 1).

Procedure

The pilot incorporated a mixed methods design, using both qualitative and quantitative methods, comprising three distinct phases. Phase 1 was a baseline assessment of demographic information and social network composition. Phase 2 comprised two weeks of Experience Sampling Method (ESM) data collection via the SoNAR app. Phase 3 was a qualitative interview exploring participants' perceptions of the link between social networks and recovery from alcohol problems, and their experience of using the SoNAR app.

Phase 1.

Following recruitment and informed consent, participants were invited to an
initial interview, conducted remotely, where they provided demographic information and
completed the BAI and BDI-II. Using the IPDA semi-structured interview, participants
and the researcher identified contacts who were in their network. Participants then
downloaded the SoNAR app and provided their first dataset as part of the setup process.
In the first use of the app, participants entered the names of those identified in their
networks using the IPDA; these names were stored in their app for the duration of the
study.

Phase 2.

Participants were prompted for responses twice-daily through the app's
notifications. These notifications were at pseudorandom time-points – that is, random
within fixed timeframes (notification 1 randomly between 11:00 – 15:00; notification 2
between 17:00 – 21:00). Filling in app data was estimated to take 30 – 60 seconds each
time.

Phase 3.

At the end of the two-week SoNAR app data collection period, participants
attended a 60- to 90-minute interview. In the initial part of the interview, the discussion
focused on participants' general experiences and perceptions of the association between
social networks and their alcohol problems and recovery. After this, participants were
shown a graph of their data which aided the generation of specific and recent examples
of social network effects (similar to those presented in Figure 2). The interview finished

with a discussion about the app's usability and acceptability. Any additional contacts added to the SoNAR app during the two-week period were retrospectively rated on the IPDA at the start of the interview. During the interview, the interviewer employed probes as outlined by Hennink, Hutter, and Bailey (2020), and Legard, Keegan, and Ward (2003).

Analysis Plan

Phase 1 network composition data were analysed descriptively. In Phase 2, Pearson's correlations were used initially to examine the relationship between the scores on the measures of temptation and confidence to ascertain whether the outcomes required separate analysis. Pearson's correlation has been found to produce a point estimate similar to mixed model approaches in repeated measures data (Irimata, Wakim, & Li, 2018). To explore the link between social network contact and measures of temptation and confidence, the planned analysis was a mixed effects ANOVA in which the impact of both within-subjects factors (number of pro-abstinence contacts seen; number of pro-drink contacts seen) and between-subjects factors (each participant entered as a different level of the factor to account for random differences) on the dependent variables (temptation and, separately, confidence) could be assessed. While this analysis would not explicate the direction of causality between ratings of confidence and temptation and contact with network members (Block et al., 2018), it would lay the groundwork for more sophisticated timeseries analysis including time-lagged correlations to investigate potential directionality. Phase 3 qualitative data was analysed using Thematic Analysis (Braun & Clarke, 2006; Harding, 2018) of verbatim transcripts of interview.

Phase 1 Results

Participant Characteristics

Clinicians at the addiction service (UK) approached service users to obtain consent for the researcher to contact them (n = 12). Six agreed to participate. Of those recruited, four were female and all were white British. Their ages ranged from 31 – 73 (M = 52 years old) with a modal annual income range of £20,000 – £29,000. Four participants identified themselves as abstinent at the time of recruitment; two participants were reducing their alcohol intake, consuming 10 and 44 units of alcohol/week at recruitment. Participants indicated recent alcohol usage had ranged from 50 – 180 units/week (M = 120 units/week) and reported a mean duration of 17.3 days since their last drink. Abstinence was the treatment goal for all participants. Three participants were prescribed anti-depressants. One participant discontinued disulfiram – a medication for chronic alcohol use which produces aversive physical reactions to alcohol intake – immediately prior to beginning the study (unrelated to participation). Participants scored a mean of 28 (moderate anxiety) on the Beck Anxiety Inventory (Beck et al., 1988) and 27 (moderate depression) on the Beck Depression Inventory-II (Beck et al., 1996). Participants' average BDI-II scores were higher than previous studies assessing participants seeking treatment for substance use, but consistent with participants with depression and comorbid alcohol use (Buckley, Parker, & Heggie, 2001; Skule et al., 2014). Participants also scored above the expected range on the BAI (McCaul, Hutton, Stephens, Xu, & Wand, 2017). Individual participant characteristics are presented in Table 1.

Table 1. *Participant characteristics.*

ID	Age	Sex	Income	Baseline Weekly Units	Recent Peak Consumption (Units)	Time Since Last Drink	Treatment Goal	Medication	BAI	BDI
1	56	Female	20-29K	0	-	28 days	Abstinence	-	45	31
2	66	Female	10-19K	0	52.4	4 days	Abstinence	Citalopram	3	8
3	57	Female	0-10K	44	175	1 day	Abstinence	Diazepam	46	58
4	31	Female	20-29K	10	50	2 days	Abstinence	-	-	-*
5	31	Male	10-19K	0	183.4	9 days	Abstinence	Rispiridone	42	32
6	73	Male	20-29K	0	140	60 days	Abstinence	Disulfiram (dis.)	7	8

Due to researcher error, Beck Anxiety and Depression Inventory scores were not collected for participant 4.

Table 2. *Network characteristics for each participant.*

ID	No. of people in network	of which Family	of which friends	of which colleagues	of which treatment contacts	of which other	No. pro-treatment	No. of drinkers	No. abstinent
1	11	5 (45.5%)	3 (27.2%)	2 (18.2%)	1 (9.1%)	0 (0.0%)	8 (72.7%)	6 (54.5%)	3 (27.3%)
2	7	2 (28.6%)	4 (57.1%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	7 (100%)	3 (42.9%)	3 (42.9%)
3	9	6 (66.7%)	2 (22.2%)	0 (0.0%)	0 (0.0%)	1 (11.1%)	9 (100%)	7 (77.8%)	1 (11.1%)
4	7	3 (42.8%)	4 (57.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (57.1%)	6 (85.7%)	1 (14.3%)
5	8	2 (25.0%)	3 (37.5%)	0 (0.0%)	1 (12.5%)	2 (25.0%)	7 (87.5%)	5 (62.5%)	3 (37.5%)
6	6	2 (33.3%)	2 (33.3%)	0 (0.0%)	2 (33.3%)	0 (0.0%)	5 (83.3%)	4 (66.7%)	0 (0.0%)

Network Characteristics

Using the IPDA (Zywiak et al., 2009), a total of 48 network members were identified across the six participants, ranging from 6 – 11 network members each (M = 8), consistent with previous literature (Copello & Walsh, 2018). Of these network members, 20 (41.7%) were family members and partners, 18 (37.5%) were friends, 5 (10.4%) were treatment contacts, 2 (4.2%) were work colleagues, and 3 (6.3%) other contacts. These proportions are broadly in line with previous studies (Day et al., 2013). 85.4% of network members were rated as being generally supportive. 64.6% of network members were drinkers (including 14.6% heavy drinkers) while 22.9% were abstinent. 31.3% were rated as accepting or encouraging alcohol consumption, compared to 52.1% were discouraging of the participants' consumption. 83.3% were supportive of the individual going for treatment, compared to 10.4% who did not support this. Compared with previous studies, fewer network members in the present study were abstinent or discouraging of participants' drinking (Litt, Kadden, Kabela-Cormier, & Petry, 2009; Stout, Kelly, Magill, & Pagano, 2012). Where percentages do not reach 100%, individuals may have rated network members as neutral or as not known – these are not categorised, in line with scoring guidelines (Longabaugh, Wirtz, Zywiak, & O'Malley, 2010). Individual network characteristics for each participant are presented in Table 2.

Phase 2 Results

SoNAR App Responses

Participants were prompted twice-daily over 14 days for responses via the SoNAR app (28 prompts). Across six participants, 159 data points were recorded (M = 26, range = 19 – 36). However, one participant (Participant 2) was unable to respond during the second week and requested to restart the trial. Therefore, per two-week period (seven in total), participants gave a mean of 22.3 responses (range 10 – 36); a response rate across the sample of 81.1%. Notably, two participants provided more responses than were prompted over the period. With the exception of Participant 2, participant response rates were relatively consistent across the period.

During the two-week period, two participants were abstinent throughout. Among the remaining four, participants recorded a mean consumption of 33.1 units over the two-week period (range = 10 – 60.9 units). Across all participants, a total of 224 separate contacts were recorded (M = 37.3) with a total of 33 network members (M = 5.5, range = 2 – 10 over the two-week period). Modal answers were "*extremely confident*" in maintaining treatment goal, and "*not at all tempted*" to consumed alcohol. Figures 2a to 2g represent individual participant responses over the ESM period including temptation, confidence and units of alcohol consumed (where applicable). On top graphs, the number of contacts seen are stacked by their perceived attitudes towards the participants' alcohol use. On the bottom graphs, the number of contacts seen are stacked by their status as drinkers or abstainers themselves.

Participant 1
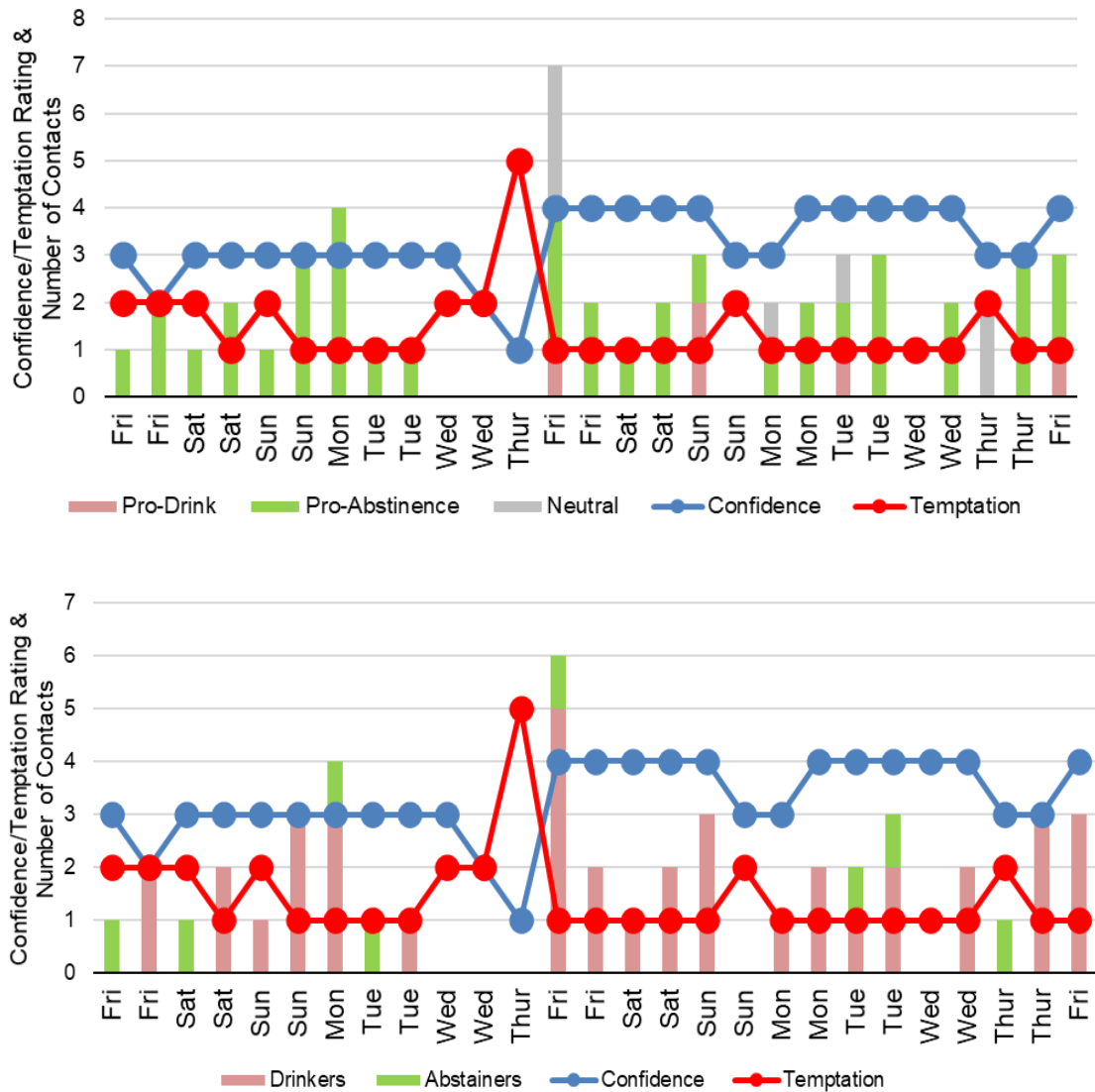
Figure 2a. Individual participant response profiles. Measures of confidence and temptation range from 1 (not at all) to 5 (extremely). **Top**: Number of contacts are stacked according to their attitudes towards the participant's alcohol usage. **Bottom**: Number of contacts are stacked according to their status as drinkers or abstainers. Where the participant drank, this is presented as units on the right-hand vertical axis. (*Figure continued below*)

Participant 2 (first trial)
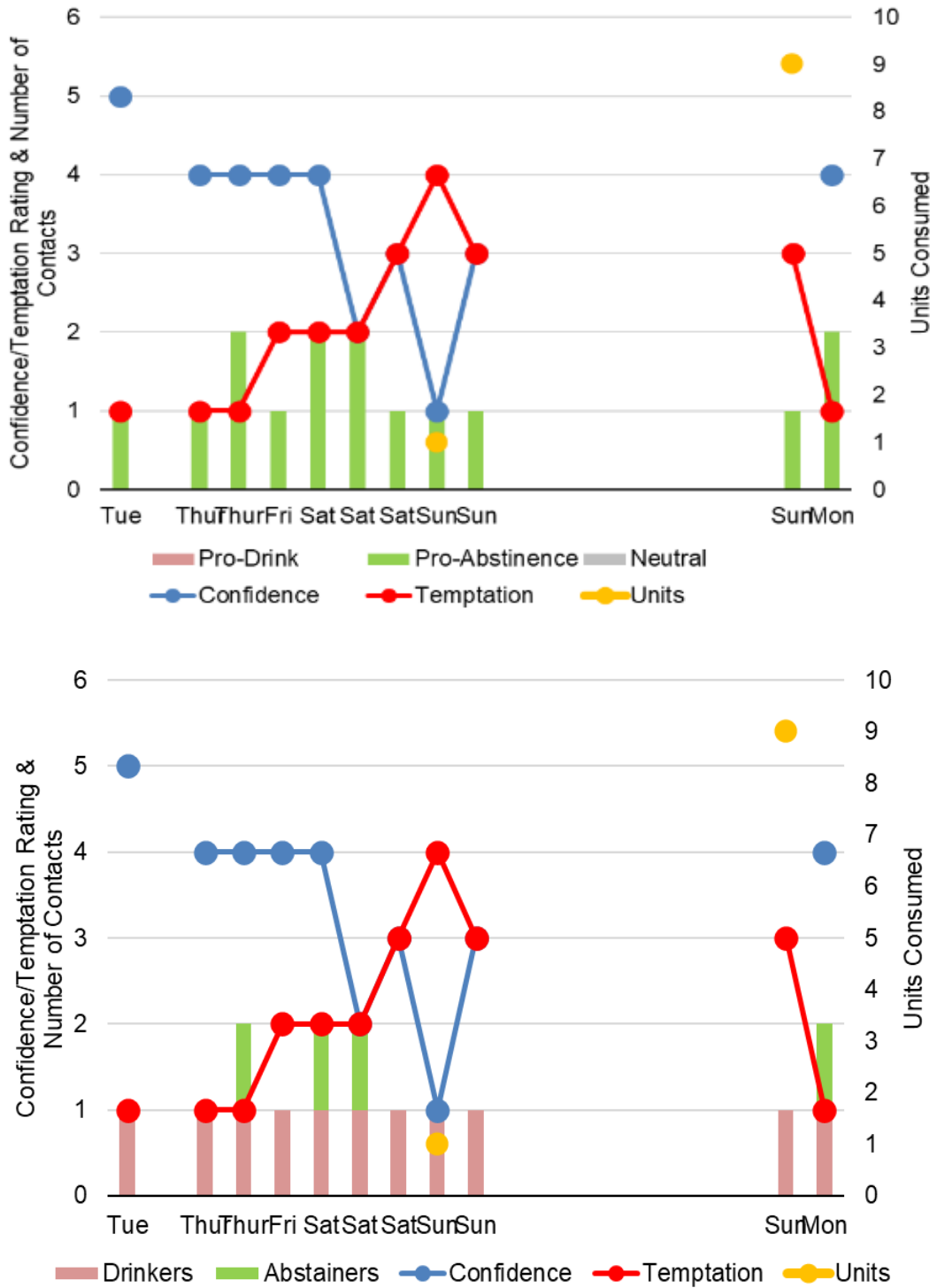
Figure 2b. Participant 2 (first trial)

Participant 2 (second trial)
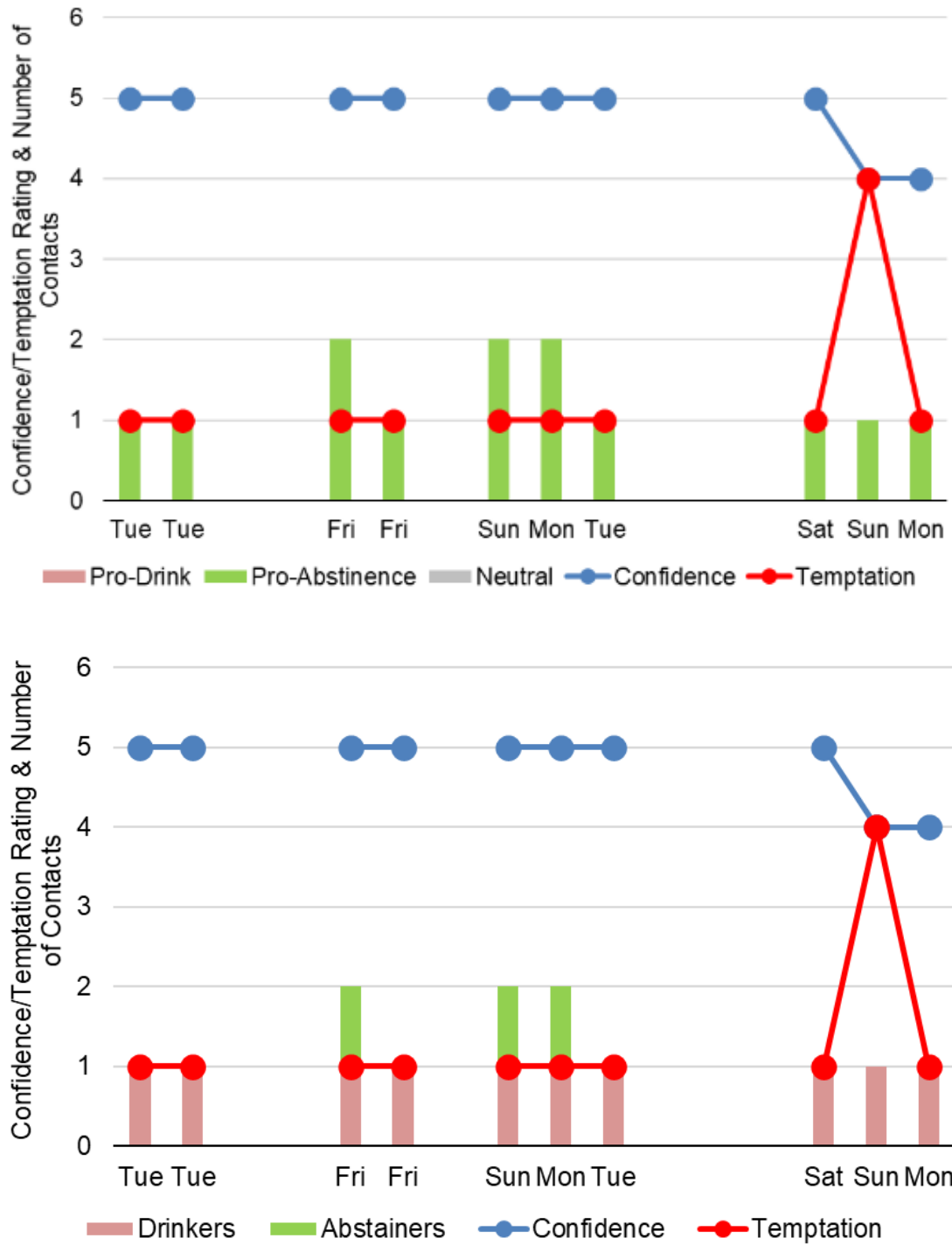
Figure 2c. Participant 2 (second trial)

Participant 3
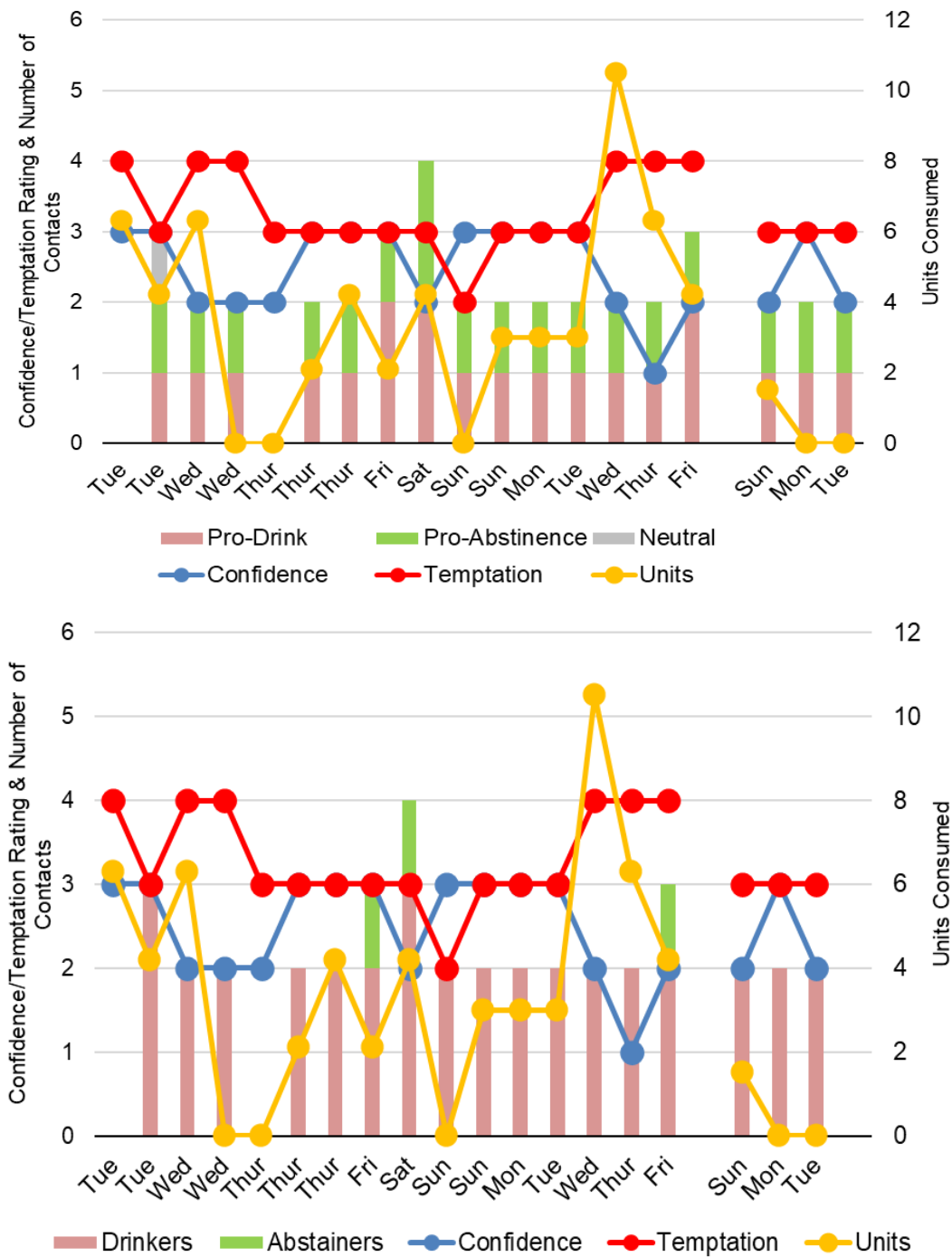
Figure 2d. Participant 3

Participant 4
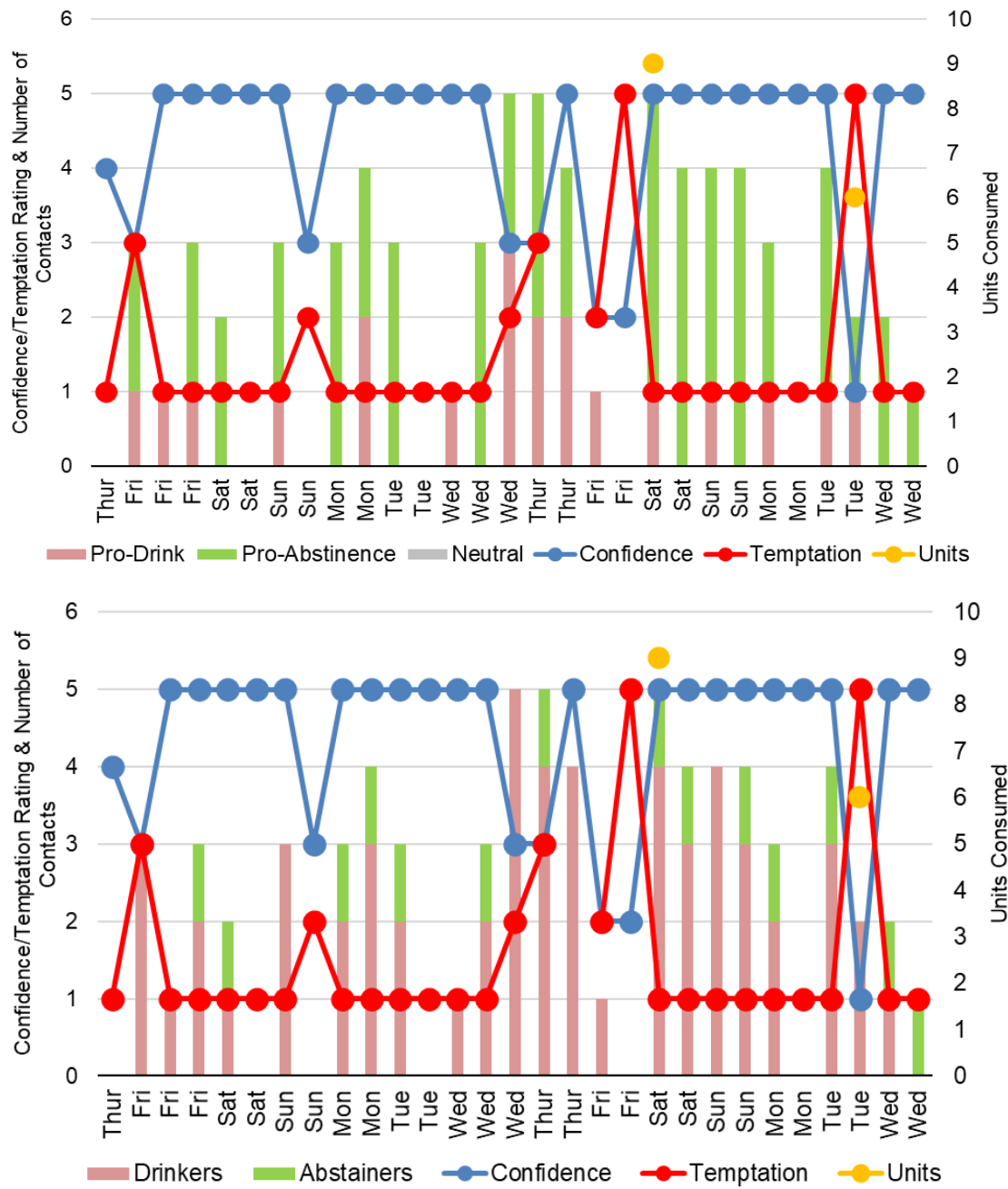
Figure 2e. Participant 4

Participant 5
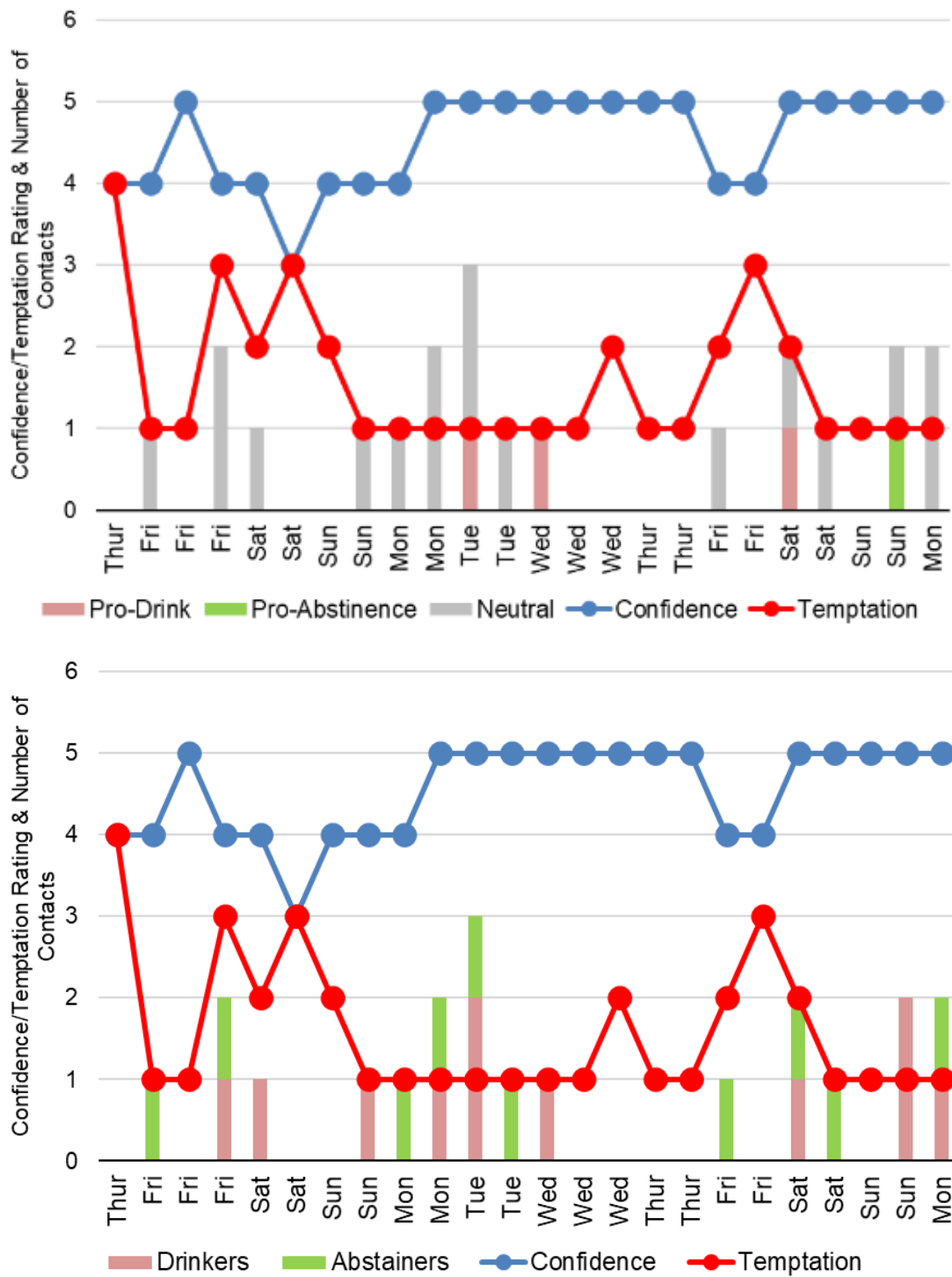
Figure 2f. Participant 5

Participant 6
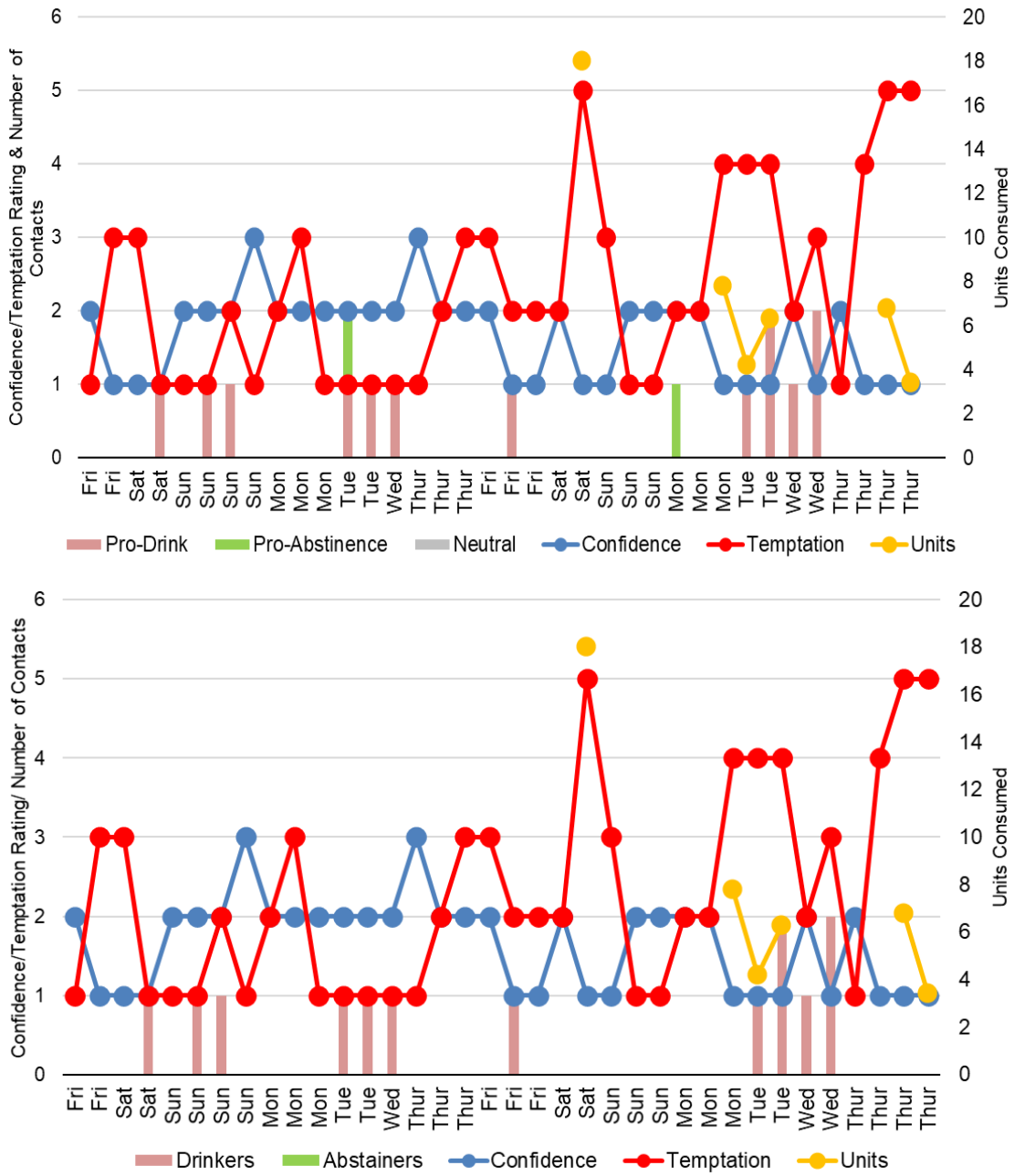
Figure 2g. Participant 6

The relationship between confidence and temptation

Participants documented their momentary temptation and confidence, as well as the network members with whom they had had recent contact. Pearson's correlations were used to test the relationship between each participant's temptation and confidence. In every case, temptation was significantly negatively correlated with confidence (Table 3).

Table 3. *Pearson's correlation exploring the relationship between confidence and temptation*

Participant	*Confident – Temptation Correlation*
1	$r = -.779$, n = 27, $p < 0.001$*
2	$r = -.737$, n = 20, $p < 0.001$*
3	$r = -.544$, n = 19, $p < 0.016$*
4	$r = -.899$, n = 28, $p < 0.001$*
5	$r = -.637$, n = 24, $p < 0.001$*
6	$r = -.685$, n = 36, $p < 0.001$*

Association between network alcohol-related behaviours and attitudes and temptation to drink

Due to Covid-19 restrictions, there were difficulties in recruiting the number of participants necessary to undertake a mixed effects ANOVA. As such, this analysis was not possible with the limited data. There is an analysis using the General Linear Model (GLM), in Appendix 2. However, the reader should be aware that this analysis is fundamentally biased as an assumption of GLM is that the error terms in the model are independent and bias free; this assumption cannot be upheld in data collected (timeseries

data) due to the inherent nature of intercorrelations at multiple timepoints. T-tests which, across all participants, compared levels of temptation and confidence (a) when in contact with pro-drink network members versus when such contact had not occurred, (b) when in contact with pro-abstinence network members versus no such contact, and (c) when having had any social contact versus none, are presented in Appendices 3 and 4. The reader should be aware that this analysis fails to uphold the assumption that data points are independent of each other and therefore has not been included in the main body of the thesis.

Phase 3 Results of Thematic Analysis

Following the two-week period of data collection, participants were invited for a qualitative interview to explore the perceived association between social network contact and recovery from alcohol problems. Six semi-structured in-depth interviews, ranging 52 – 107 minutes, took place remotely via video call. The semi structured interview schedule (Appendix 5) was developed by the author (TW) and research supervisor (AC). Interviews were audio-recorded and transcribed verbatim by the author. A sample of transcriptions were reviewed by the research supervisor (AC) for quality control. Transcripts were then analysed using Thematic Analysis (Braun & Clarke, 2006; Harding, 2018). The first author, following familiarisation with the transcripts, proceeded to code each transcript on the margins. Emergent themes were noted and analysed for commonalities, then developed into higher-order categories. Higher-order categories captured the experiences at a higher level of abstraction and were made up of the sub-themes as illustrated in Figure 3. The higher order categories were developed by

examining the codes collectively and drawing together different codes across the data set, to develop the overarching four categories. During analysis, the researcher did not attempt to infer meaning beyond the verbatim data, aware that researchers can bring with them preconceived ideas and assumptions which may bias data collection and interpretation (Levitt, Motulsky, Wertz, Morrow, & Ponterotto, 2017). Reflexivity was addressed via regular discussions with the supervisor and one trainee colleague in the course (also conducting qualitative research) whereby the researcher discussed, explored and if relevant challenged preliminary ideas and findings as the final results were developed.

From the interview analysis, four higher-order categories were identified; (a) the impact of a drinking network, (b) the ways in which networks support change, (c) the presence and awareness of the network, and (d) the bidirectional link with relationships. Each higher-order category is presented and summarised, followed by the constituent themes making up the category. Illustrative quotes from participants are used to illustrate each theme and presented in italics, indented and with the participant number at the end.
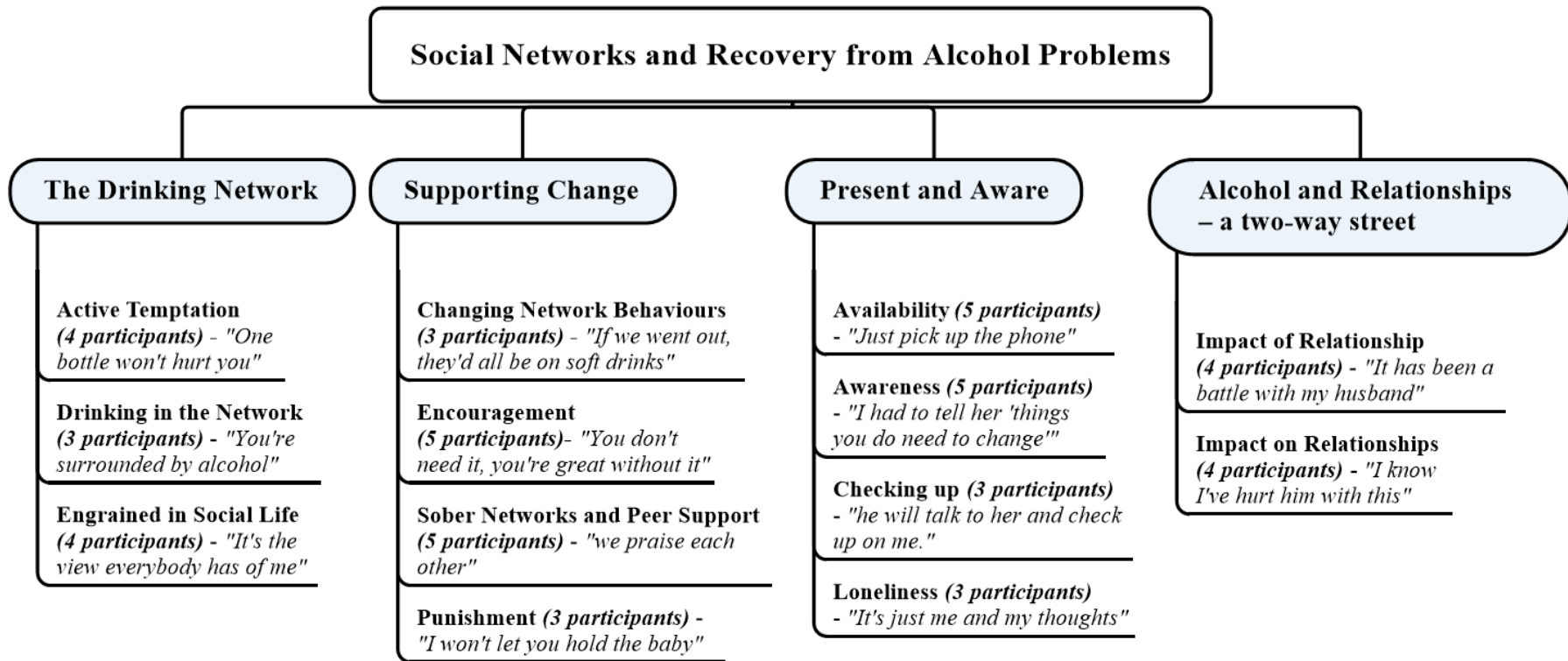
Figure 3. Higher-order categories and their sub-themes

Higher Order Category 1: The Drinking Network

The majority of participants highlighted the detrimental impact of drinkers within their network on their attempts towards abstinence. The impact of drinkers was described both in terms of active attempts to encourage participants to drink, as well as the passive or naïve influences when being around drinking network members – culminating in both direct and indirect social pressure to drink (Larimer, Palmer, & Marlatt, 1999). Some participants spoke specifically about alcohol being engrained within their social lives. Participants' own words have been used where possible to add to the definition of the themes.

Active Temptation – "*one bottle won't hurt you*"

Several participants described ways in which those in their network would seek to actively tempt them to drink, despite knowing that they were attempting to abstain. It was perceived that these network members wanted to drink; and want the participant to be involved. In some cases, the participant perceived these individuals to have alcohol problems themselves. This perhaps outlines the detrimental impact of heavy alcohol users within a network who, themselves, are pre-contemplative (Prochaska & DiClemente, 1992) in terms of changing their alcohol use, as such individuals may wilfully present participants with high-risk situations (Larimer et al., 1999).

> *[My housemate] would sometimes want to go out on a night out with my cousin and he would always invite me along even though I would say no. And I'm like- I would like explain, you know, it's- it's a problem with drinking. I can't- I can't really do it. And then he'd be continuously asking the question when I'm bound to end up caving in. Or at times, just leaving money on the side when I didn't have any money and saying*

to me like, "oh, there's money there to get a drink if you feel like you need it" and I'm like, "okay, you're meant to be helping me with my alcohol problems. Not putting it on a platter for me." (Participant 5)

When we've been out and I'll say "oh well, I'll drive" and- when we go out for lunch and that- but she'll still say "oh you'll be alright, you can have one" and then she'll buy a bottle and then she'll say "you can have a drop more". - but I think that's because she wants to do it as well. (Participant 3)

Drinking in the Network – "*you're surrounded by alcohol*"

In contrast to active attempts at temptation, participants spoke about the presence of alcohol and drinkers in their networks and a more passive or unintentional influence that this can have on their recovery. This influence tended to be more naïve in which presence of alcohol-related conversations, drinkers or others' alcohol use acted as a cue for cravings and presented high-risk situations in which confidence or self-control was tested (Larimer et al., 1999).

She has got no idea about my background - the fact that I've only just met her - I've struggled with alcohol, and she says, "Oh, have you tasted that peach gin? It's amazing". ... people talk about alcohol a hell of a lot ... But as soon as someone mentions a drink, you know, at work, it sort of gets my taste buds going. And I'm thinking "oh- oh, can I?" and then it's like the other voice in your head saying "no, no you can't. They can but you can't." (Participant 4)

I could start going down there for meals and that- and that was when I did crack first, you know… we're having a meal, they're having a drink and I tried for a few weeks [not to drink] and I said, "oh", you know, "I'll have a drink" and that- that- that- was my first relapse (Participant 6)

You're surrounded by alcohol. It's like shall we go to a beer garden? Shall we go for dinner? Shall we go for lunch? Shall we get a bottle of wine with the lunch? And it's like alcohol comes with everything. So, I think because I always liked to drink, I attracted the people that liked to

drink. And now I'm trying to sort of step away from that, I- I almost feel
like I'm being pulled back in a way and that I need to sort of push them
away for myself. Because they won't change. They won't make any
positive changes. (Participant 4)

Engrained in Social Life – *"it's the view everybody has of me."*

A number of participants spoke about how their social lives and relationships with

friends were engrained with alcohol. The common theme was a perceived expectation

from the network that the participant should drink and that this served a function within

their interactions. For participant four, this quite explicitly linked to the 'selection

hypothesis' (Buchanan & Latkin, 2008; Bullers, Cooper, & Russell, 2001) in which one's

behaviours and qualities attracted a network of similar individuals over time.

And people expected me to be the silly one- the stupid one who was
doing all the dancing and the rolling about on the floor and making
everybody laugh and everything. So, I suppose people used to buy me
drinks and that's what people relied on to have a good time. And I'd go
along with it. I'd just do it. Because I think well, "they really love me,
they really like me making a good time". (Participant 3)

But it's like sort of the people that I am closest to – people who are
closest to me are the drinkers because that's what I've been for a long
time. Before Covid and everything I was the sort of 'go-to girl'. If
someone's got a broken heart, they will turn up at my door with a couple
of bottles of wine and I am there too sort of listen to everything and give
them advice that they'll never ever take...it's the sort of view that
everybody has of me. With it comes alcohol. (Participant 4)

Higher Order Category 2: Supporting Change

All of the participants spoke about people in their network who have helped them

to effect change. The mechanisms supporting change included changes in behaviours

within their networks, providing encouragement, the presence of a non-drinking network, and ways in which drinking were punished.

Changing Network Behaviours - "*If we went out, they'd all be on soft drinks*"

A number of participants spoke about the ways in which network members had made deliberate changes in their behaviours and interactions to support their abstinence. In all cases, this was among contacts who, themselves, were drinkers but understood the impact of their behaviour – at times through having witnessed the participant's crisis point similar to that described by Orford et al. (2006). These changes in behaviour contrast with both the intentional and naïve influences of network drinking previously described.

> *I mean all of my friends now. If I went out with them, they'd all be on soft drinks as well, even though I've tried to tell them they don't need to not drink front of me, but that's- that's the way it would be. I know it is so… they're supportive of me not drinking. (Participant 1)*

> *Mum, for example, she would have a drink but she wouldn't do it in front of me. She would feel awful to do it in front of me because she knows it doesn't agree with me. (Participant 4)*

> *Since the last time I stopped drinking, my sister has now started to take it on board – so conversations are nothing to do with alcohol and if it is, it's just her saying that she's proud of me. (Participant 5)*

Encouragement – *"you don't need it, you're great without"*

Participants described a range of ways in which network members provided encouragement which appeared to reinforce efforts. These were predominantly positive statements that the participant appeared better and encouragement to continue in their

efforts. Such statements appeared to strengthen participants' resolve, and – for some –

reflected improvements in relationships.

> *Just having someone else say that you are looking a lot better physically and seem a lot better mentally is encouragement in itself. (Participant 5)*

> *And I've got a couple of other friends that aren't big drinkers that will sort of say "Oh yeah, you don't really need that, you are great without it, you don't need that" and sort of reaffirm that if you have that drink tonight, you will feel terrible tomorrow, think about that. And then there's me going "oh god yeah actually forget that. I don't want to feel like that." (Participant 4)*

> *[My friends] just talked about it, talked about what was wrong, how far I'd come, encouraged me really to keep going, to think about the positives of how far I've come and not to dwell on any negative thoughts so- and it worked (Participant 1)*

Sober Networks and Peer Support – "*we praise each other when it gets to a certain week*"

A number of participants spoke about the positive impact of having non-drinkers

within their network. While several spoke about the benefit of having others who are

recovering from alcohol problems within their network, some also spoke about the

positive impact of their sobriety on other drinking contacts. In contrast to heavy alcohol

users who may be liable to tempt participants to drink, the presence of those with high

alcohol usage within a similar stage of change (be it contemplative or further; Prochaska

& DiClemente, 1992) appears to be a source of encouragement, motivation and practical

advice.

> *[My friend] kind of had a bit of a drinking problem herself before. So, she's kind of- There's been a couple of months where she hasn't drank*

now so just having the same situation is encouragement as it is. And we praise each other when it gets to a certain week. (Participant 5)

The ones who run the support meetings – whether it's because they themselves have been users of various things, they're more inclined to just – what's the right word? Just sort of be encouraging really, rather than try to be motivating – sort of, because they know what I should be doing. I find it more motivational, that, than talking to [my support worker] probably. (Participant 6)

Similarly, one participant spoke about how their sobriety was having a positive impact on other drinkers in their network.

I've been open about it...I was embarrassed about at first. But by doing that -it's a good thing. It's given them something to think about. Because [my friend] was saying to me the other day that her and her partner have cut down. And their daughter. (Participant 3)

Punishment – "*I won't let you hold the baby.*"

Several participants spoke about the ways in which their networks react negatively to their alcohol use, often producing feelings of guilt or shame. This often makes explicit to the participant the negative impact of their drinking on others – who experience feelings of anger and disappointment – and consequences for themselves. For the participants, this aversive experience acted as punishment for drinking and motivation to remain abstinent.

If [my daughter] knows I've had a drink she'll tell me off and she doesn't hold back…And then she probably won't talk to me for a couple of days which hurts. She'll say "mum this has got to stop or I'm not going to speak to you. It's got to stop or I won't let you hold the baby." So, I've really got to get my mind together before June because I want to see my grandchild (Participant 2)

And I've been honest with my mum as well when I've had a drink last
Friday. You know, she says, you know, "did you have a drink
yesterday?" And this was over text. And I said "yeah, I did." and she
said "yeah, okay. I'm not going to say anymore" and that was- that was
sort of it. I know that she was disappointed in me. She knows what that
does to me, especially on a hangover. (Participant 4)

Higher Order Category 3: Present and Aware

All of the participants made reference to the availability, presence and
understanding of their networks. These aspects of their support were related to the ability
of their network to provide support as needed. However, participants sometimes differed
in their reaction to their network's involvement; some perceiving this as useful, others
experiencing frustration.

Availability – "*just pick up the phone*"

Availability of one's network as a common theme among most participants. In
most cases, the participant themselves had control over this process – being able to call
as needed. This may be regarded as a one of a number of available coping strategies that
can be employed to increase self-efficacy and reduce the risk of relapse (Larimer et al.,
1999) and links with ideas of 'recovery capital' in which supportive relationships are a
social resource to be drawn upon (Best, McKitterick, Beswick, & Savic, 2015).

They've formed a little group a Whatsapp group – my friends and my
daughter – so if any one of them's got a concern at any time...my
daughter lives in London, so one of my friends will always pop round
just to make sure everything's okay... One of my friends has actually got
a set of keys to my flat now (Participant 1).

About half two, I get a bit twitchy and I start to think I could do with a drink. I could do with a drink. [My friend] said to me "just phone me". She said just pick the phone up, I'm always free around half two, three o'clock. She's right behind me.

I'm lucky because I know that I've got people there to help and support me. And I know that if I am feeling low, or I'm feeling vulnerable, I can turn to them. And I appreciate the odd message. (Participant 4)

Awareness – *"I had to tell her 'things you do need to change'"*

Participants spoke about the extent to which the network was aware of the problem, aware of their role in the problem, or understanding the drinking as being a problem. This appeared to have a large impact on the network's response. When unaware of the extent of the participants' drinking problems, networks were prone to permit, encourage and enable the drinking. Awareness of the problem was often a precursor to behaviour change within the network towards promoting the participant's recovery. At times, awareness came from witnessing crisis points for the participant.

I've been very honest with [my friends] and also with what had happened to me over the last few months – it did impact on them, you know, they saw it first-hand, they had to call the ambulance, so they're very aware of exactly you know, what it would mean if I went down that road again...They've all been very supportive of me not drinking because of the seriousness of- of what had happened. Until- until now I think they all thought you know, "everyone can have a drink it's fine, it doesn't matter" but with what had happened to me, they've all realized. (Participant 1)

My daughter's a bit more ambivalent to me, she's still thinks I could, you know, have a social drink and be alright, so I think I don't think she really realizes, you know – I don't think she'd ever seen me when I was drinking too heavily really… She just sort of says things like, you know, "Everyone I know, all my friends and that, we all have a glass of wine and blah blah" so and - it wasn't encouraging it just wasn't discouraging...just permitting. (Participant 6)

I told them how about it was and I told them, you know, how much I'd been drinking at the height of it. And [husband] did say to me "I didn't realize you were drinking as much as you told us" … No, I wouldn't - I'm not going to admit to somebody that - you know - I've already drunk two bottles of wine before you've bought me this third one. (Participant 3)

Then I had to tell her, you know, "things you do need to change because I stopped for a week and a half and then because you stayed here longer than you were meant to that put me into a mindset that made me want to drink". (Participant 5)

Checking up – "*He will talk to her and check up on me.*"

A number of participants spoke specifically about being checked up on. This appeared to be when the availability and presence of one's network led to some loss of agency. For some, this was experienced negatively while others found this beneficial. This bears similarities with previous qualitative studies highlighting the ways in which families and networks may exercise control over participants' drinking (Orford et al., 2006).

I try and be as honest as I can [with my support worker] – I'm not always as honest as I should be. [My husband] tells me off about that, because he will talk to her and check up on me. (Participant 2)

I'm the older sister and to have my younger sisters sort of really on my case; "What are you doing? Where are you going? Who are you seeing? Who you speaking to on the phone? Who are you texting?" It's just overbearing… And that makes me feel like I want to have a drink (Participant 4)

They have sort of backed off, to be honest, since they've known that I'm not turning to the bottle at every opportunity. They have sort of given me my space and my freedom. Because I felt like they'd taken that away from me. (Participant 4)

Loneliness – *"it's just me and my thoughts"*

In contrast to availability and presence, several participants spoke about the impact of loneliness on their drinking. Loneliness appeared to impact on drinking via a number of avenues. For some, it meant there was nobody to stop the participant from drinking and take some control. For others, loneliness was itself a high-risk situation associated with negative emotional states (Larimer et al., 1999).

> *When I was living with my wife, erm, you know, if I said, you know, "I think I'm going to go out and get some beer", you know, she might say well, you know, "do you really need to?" ... I think it's really difficult living on my own because if the mood takes me to go and get a drink...I'm on my own. (Participant 6)*

> *I do think about drink a lot when I am on my own because when I'm on my own it's just me and my thoughts. And a lot of the times negative thoughts will come into my head and my- I guess- second nature in terms of avoiding them thoughts, or suppressing them would be drinking. (Participant 5)*

> *I think a lot of it's to do with perhaps loneliness; it's still something I'm getting used to, I was with [my late-husband] for 30 years; so, to go from that to this, yeah it can be quite lonely so I think that's part of it as well. (Participant 1)*

Higher Order Category 4: Alcohol and Relationships – a two-way street

All participants spoke about their close relationships. Close relationships were reported to have an impact on the participants' alcohol usage. However, there were indications that the relationship was bidirectional with alcohol usage having a negative impact on close relationships. At times, this bidirectional relationship appeared to lead to vicious (or virtuous) cycles within intimate relationships.

Impact of Relationship Quality – *"It has been a battle with my husband"*

A number of participants spoke about the quality of their relationships with others. Relationship quality appeared to impact on both the temptation to drink and the effectiveness of 'interventions' by family. Where relationship quality was good, the temptation appeared less for some when with partners, and interventions by family members appeared more effective when perceived to be supportive. Where relationships were more strained, this often acted as a trigger for drinking.

> *I was watching something and it was just decided to switch it over and watch something that they [husband and daughter] wanted to watch. And that was it. And I just went upstairs and drank... I sometimes think perhaps it's what they want me to do. Drink myself to oblivion. Or give them the excuse to say "right, that's it. Marriage is over. You are no good." (Participant 3)*

> *I think if [my husband] says it ["stop drinking"], it's just a case of "no I'm having another one because you've pissed me off by telling me." You know. So- yeah, whereas if [my son] says it, it's like you're saying it because you're doing it for me. (Participant 3)*

> *It's most peculiar, even when I go out with [my husband] I don't want to drink, I don't need to drink. It's funny, I think – how can I put it – I feel more confident when I'm out with him, erm, and I don't need anything else. (Participant 2)*

Impact on Relationships – *"I know I've hurt him with this"*

Several participants spoke about how their relationships, especially intimate relationships, have been impacted by their alcohol usage. Some spoke about the emotional impact on their partners which had led them to seek professional help. For others, alcohol

was perceived as having been a barrier to intimacy and a source of tension within relationships. At times, the strained relationship would be a trigger for drinking.

> *I know I hurt him when I have a drink... He's got a counsellor, if you like, to try and help him because it has affected him. (Participant 2)*

> *Which came first the chicken or the egg? Did [my husband] want my company before I started drinking? Or was it because I started drinking that he didn't want me to be around as much as before? ... And I thought, well perhaps it is because of the way I have been. Perhaps he hasn't [been intimate] because I've been drinking and you think you're alright. You think you're handling it okay. That you're not- But you're not- You don't know what you smell like; what you look like. So, it's probably put barriers up there. But, you know, and that's made me want to drink more; thinking that he's not wanting to be romantic or passionate or, you know (Participant 3)*

> *It put a strain on the relationship and he used to say to me "you look just like your dad when you've had a drink" and he hated it because he was more-or-less teetotal. (Participant 4)*

The Impact of Covid-19 on Recovery from Alcohol Problems

The present pilot took place at an unprecedented time, in the context of a global pandemic. Early evidence has begun to emerge for the changes in drinking patterns during the Covid-19 lockdowns (French et al., 2020; Pollard et al., 2020). Furthermore, restrictions on social contact are likely to have impacted on the findings of the present study. It would be both remiss and a wasted opportunity to ignore the impact of Covid-19 on recovery from alcohol problems. As such, the following section outlines themes specifically related to Covid-19, which may contextualise the themes previously highlighted.

The Availability of Drinking Cues – *"We can't drink together"*

Several participants spoke about a positive effect of lockdowns, which enabled them to distance themselves from drinking networks, avoid drink-related social activities, or reduced their access to alcohol. As such, the lockdowns reduced the likelihood of encountering high-risk situations.

> *So, I suppose because of lockdown, I can't go over there - so we can't have a drink together. So, that's a good thing. (Participant 3)*

> *Well luckily lockdown has seriously helped. I've just not really- I kind of gave myself a distance from everybody. I haven't completely secluded myself, but I gave myself enough distance that I don't really see anyone or talk to many people at the moment. And if it is, it's very, very brief. And it will be over text. Or on the phone for a couple of hours… and alcohol will probably be related to something there. So yeah, just kind of taking myself out of the situation and putting people at arms-length, really. (Participant 5)*

> *I stopped drinking. And I stopped drinking for like 10, 12 weeks. More perhaps. Basically, it's because I was scared to go to the shop to buy it and I don't like to go and buy in bulk because that's just really asking for trouble, you know, to go and buy six bottles of wine or a dozen bottles of wine… I found it's easier to stop because of the lockdown and the pressure on not going to the shops more than you needed to... my daughter was saying "no, you don't go shopping. If you want anything, I'll get it for you". I wasn't going to ask her to keep coming with booze every day and so I stopped. (Participant 6)*

Availability of Support – *"it's a lot on your own"*

Several participants spoke about the availability of support. For most, the lockdown made it harder to access support, see supportive friends, or to escape difficult 'dynamics' at home. Therefore, while participants appeared to benefit from distance from pro-drink contacts, they were also distanced from those who were supportive.

> *It's not having the freedom to get up and go out when things have been sticky here [a previously identified trigger] – to just escape and go and have some time with somebody else – just being able to go over the road and sit with [my friend] for a while and have a cup of tea or a coffee. It's been really hard (Participant 3)*

> *Because of lockdown it's not ideal, so I generally meet up with them for a walk because I can meet one person at a time and go for a walk… Going into the second lockdown to me was worse because of what had happened in the first lockdown it was like "oh my god, here we go again" … because it is a lot when you're on your own. (Participant 1)*

While most spoke about the impact of lockdowns on the availability of support, one participant felt a move to online support groups had been beneficial – removing barriers to their attendance.

> *I don't think I'd have gone to all the [support] meetings if they hadn't been online- if I'd had to sort of go and get in the car or catch a bus or whatever you know, I might have been tempted not to bother. But given that, you know, I can just sit here and join the meeting for an hour, it's very convenient. (Participant 6)*

Coping and Boredom – *"no one to see, nowhere to go"*

This factor relates more directly to the relapse prevention model by Marlatt and Gordon (1985) which states that negative emotional states are associated with the highest rate of relapse. For some participants, boredom was a big factor and drink was a way of passing the time when unable to keep occupied by other means. Similarly, some participants spoke about using alcohol to cope with Covid and grief.

> *I wasn't allowed to go to the hospital with him when he- when they took him in the ambulance because of Covid, so I think all of that as well had an impact on me drinking and the level it got to. I think Covid has had a massive impact on you know, a lot of people, me included - and I think*

*obviously it's easy to sit at home and just think "oh I'll just have a drink"
and it'll all go away. But it doesn't. (Participant 1)*

*[Covid had] a negative impact because I was constantly always alone
and just, you know, I wanted to drink all the time. There was nothing to
do. No one to really see. Nowhere to go. I just drank. (Participant 5)*

*When the first lockdown started, that's when I started drinking a lot.
Obviously, at that point nobody was leaving the house so it was like
there is no night and day anymore - it's all just rolled into one. So, I
mean, I was drinking three bottles of wine in one sitting back then. But
it was literally boredom, you know, and FaceTiming: "Have you got
your one? Yeah. I've got mine, have you got yours?" And you'd have
that company over the phone, over FaceTime, and we'd get completely
smashed together and it would be completely great. (Participant 4)*

Discussion

The present case series was a pilot study exploring the impact of social network

contact on recovery from alcohol problems using novel methods. The study was based on

a mixed methods approach, focusing on both the observed (quantitative) and perceived

(qualitative) role of social networks in ongoing temptation to drink, confidence in not

doing so and subsequent consumption behaviour. Taken, together the results show that

the concepts explored were relevant and important from the participants' perspectives,

and that the ESM methods to monitor influence of social contact on temptation to

consume alcohol are feasible and can be further studied in a larger trial. The study

presented a number of ways in which networks are likely to increase participants'

temptation or facilitate abstinence, as well as a number of bidirectional links with

relationship quality. To the author's knowledge, the present study is the first to investigate

the impact of ongoing network contact on momentary temptation and confidence using

ESM. Where previous literature has sought to link social network structure with alcohol-

related outcomes (Meisel et al., 2015; Zywiak et al., 2002), the present study explored
their impact on a day-to-day level in real time. Some of the key findings are discussed in
more depth below.

As an approach to the literature, the study was, to some extent, exploratory. It
reported a range of important findings, including network characteristics, adherence to
the potentially demanding methodology, visual representations of the relationships
between ongoing contact and momentary drink-related outcomes, and qualitative
exploration of participants' lived experiences of these relationships. Cumulatively, the
findings reported represent a holistic investigation of the association between social
networks and recovery from alcohol problems. Further, the findings suggest that the
methodologies developed and used, and the focus of the study, are feasible, relevant and
acceptable to participants and should be further explored in a larger study.

The study reported several key findings relating to participants' lived experiences
of network influence on their drinking. These findings begin to explicate the link between
network composition and prognosis during recovery from alcohol problems (Zywiak et
al., 2002) and share similarities with previous qualitative studies highlighting the
importance of developing sober networks, and the 'triggering' impact of drinking
networks (Brooks, Lòpez, Ranucci, Krumlauf, & Wallen, 2017). Qualitative interviews
highlighted that network members appear pivotal in facilitating or averting high-risk
situations (Marlatt and Gordon, 1985; Larimer et al., 1999). While some network
members made deliberate attempts to entice participants to drink, others – often
unwittingly – exposed participants to high-risk situations passively through their own
alcohol consumption or discussions about alcohol. Awareness of the network members

to the problem was a common theme among the narratives; whether or not they perceived the participants' alcohol usage as problematic. Where there was less awareness among network members, they seemed more likely to naively expose participants to high-risk situations. Among network members who were pre-contemplative (that is, unaware or not intent on changing their alcohol usage; Prochaska & DiClemente, 1992), deliberate temptation of participants appeared more likely. Therefore, awareness, personal motivation and behaviour appear relevant in mediating network responses to participants' drinking. While these mechanisms relate to an influence hypothesis (Latkin et al., 1999), some accounts given by participants also offered support for the selection hypothesis (Buchanan & Latkin, 2008; Bullers et al., 2001) with participant four highlighted the way in which they had developed a drinking network through their long-term alcohol usage.

Participants outlined a number of ways in which their networks supported their recovery. The presence of those recovering from alcohol problems within the network appeared to provide a unique form of support characterised by praise, practical advice and empathy. This support was often mutual. Among other network members who changed their behaviour to support participants (e.g., avoiding drinking around them), understanding of the problem and their influence on it were common themes. At times, this awareness came from witnessing the participant in crisis. While Orford et al. (2006) highlight the role of such crises (or 'catalysts') in precipitating the 'alcohol-using' individual's entry into treatment, the present findings further highlight the role of crises in changing network awareness and behaviour. As well as reducing exposure to drinking-related cues, network members were likely to be a source of both reinforcement of sobriety and punishment of alcohol usage.

Loneliness and isolation (both physically and relationally) appeared to be key factors, and link with previous findings that social exclusion may lead to relapse (Zywiak et al., 2002). Availability of one's network – knowing that support is there when needed – was perceived as beneficial by participants. This perhaps links with the concept of 'recovery capital' in which supportive relationships are a social resource to be drawn upon to aid recovery (Best et al., 2015). When alone, participants reported experiencing greater temptation to drink; a pattern which is also noticeable through visual inspection of response profiles (Figure 2; especially participants 1, 5 and 6). These results were consistent with previous literature stating that increased social contact can lead to reductions in alcohol use (Peirce et al., 2000). However, some participants reported feelings of isolation and loneliness within their relationships. This led to a vicious cycle of marital difficulties and increased alcohol usage and demonstrates the negative impact of alcohol use on relationships, consistent with previous studies (Orford, Velleman, Copello, Templeton, & Ibanga, 2010). Taken together, the analyses suggest that both quantity and quality of social network contact may be important (Witkiewitz & Marlatt, 2004).

As a pilot, the present case series explored the viability of the methodology. By and large, the method was effective. Participants were able to identify substantial and varied social networks, the composition of which were found to be broadly in line with previous studies (Day et al., 2013). Participants engaged with the SoNAR app with minimal additional prompting and with some indeed providing more data points than were requested. During the study, participants appeared to find the ESM monitoring highly relevant and were interested in their results suggesting also the usefulness of this

approach as a clinical tool. No participants dropped out of the study. The mean response

rate of 81.1% was consistent with previous studies using ESM technology (Armeli et al.,

2008; Cooney et al., 2009; Fatseas et al., 2015; Serre et al., 2012; Shiffman, 2009) while

the data itself captured fluctuations in temptation and confidence, often consistent with

narratives presented. Participants gave feedback on the app at the end of the interview

(not reported here), which will be used to improve the app prior to the larger study.

Finally, the present study found that Covid-19 was perceived as having had both

a positive and negative impact people's recovery from alcohol problems. Participants

highlighted the way in which access to alcohol cues and high-risk situations had been

reduced in some cases. However, the pandemic appeared to negatively impact access to

social support and increase isolation and boredom, leading to greater risk of temptation.

This is concordant with previous findings that Covid-19 led to increased levels of social

isolation which were associated with increased substance use as a way of coping (Clair,

Gordon, Kroon, & Reilly, 2021).

Strengths and Limitations

The present study had a number of strengths. Primarily, as a novel approach to the

research question, the use of a mixed methods design allowed the author to examine the

effectiveness of the method and SoNAR app in capturing valuable data relating to

recovery from alcohol problems. The qualitative data explores participants' lived

experiences while linking with response patterns where possible. In using ESM, the

present study further benefitted from an accessible methodology using smartphones

which have been previously noted as an unobtrusive way to collect momentary state data

(Rickard et al., 2016). As a result, the paper presents a rich dataset to be built upon, and a promising avenue for investigating the impact of social networks on alcohol recovery.

There are some limitations to the present study. Firstly, the sample size is very limited due to the challenges of remote recruitment (arising from Covid-19 restrictions). While the data collected is high-frequency and rich, more data and participants were required to perform the ANOVA analysis that would account for between-participant differences, as well as more sophisticated timeseries analysis. As such, any quantitative analysis conducted on the present dataset failed to meet statistical assumptions of independence of datapoints and therefore could not be regarded as unbiased. Without timeseries or mixed effect analysis, the present paper is unable to demonstrate the statistical potential of the methodology or quantify links between social network contact and alcohol recovery.

Furthermore, while the methodology aimed to be as unobtrusive as possible, the study required commitment and ongoing engagement for two weeks. As such, only 50% of those contacted agreed to participate, which may cause selection bias towards those who are more engaged or more aware of their social networks. Data can similarly be biased by missing responses (Shiffman, 2009) that may be more likely to occur at times of higher temptation (Litt, Cooney, & Morse, 1998). Crucially, the study took place during the Covid-19 pandemic, in which patterns of social contact changed markedly and during which early reports suggested change in alcohol consumption patterns (Alcohol Change UK, 2020; Pollard et al., 2020). As such, the present findings may be atypical relative to pre- (or post-) Covid-19 patterns.

Conclusion

The present study was designed as a pilot case series with a view to setting up a larger trial. The methodology was found to be effective, feasible and acceptable to participants. While quantitative analysis is limited due to the small sample size, visual inspection of response profiles accompanied by qualitative analysis provide a rich account of ways in which social network influence recovery from alcohol problems.

References

Armeli, S., Todd, M., Conner, T. S., & Tennen, H. (2008). Drinking to cope with negative
moods and the immediacy of drinking within the weekly cycle among college
students. *Journal of Studies on Alcohol and Drugs, 69*(2), 313–322.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring
clinical anxiety: psychometric properties. *Journal of Consulting and Clinical
Psychology, 56*(6), 893–897.

Beck, A. T., Steer, R. A., & Brown, G. (1996). *Manual for the Beck Depression
Inventory-II.* San Antonio, TX: Psychological Corporation.

Best, D., McKitterick, T., Beswick, T., & Savic, M. (2015). Recovery capital and social
networks among people in treatment and among those in recovery in York,
England. *Alcoholism Treatment Quarterly, 33*(3), 270–282.

Block, P., Heathcote, L. C., & Heyes, S. B. (2018). Social interaction and pain: An arctic
expedition. *Social Science & Medicine, 196*, 47–55.

Bohnert, A. S., Bradshaw, C. P., & Latkin, C. A. (2009). A social network perspective on
heroin and cocaine use among adults: evidence of bidirectional influences.
Addiction, 104(7), 1210–1218.

Brooks, A. T., Lòpez, M. M., Ranucci, A., Krumlauf, M., & Wallen, G. R. (2017). A
qualitative exploration of social support during treatment for severe alcohol use
disorder and recovery. *Addictive Behaviors Reports, 6*, 76–82.

Buchanan, A. S., & Latkin, C. A. (2008). Drug use in the social networks of heroin and
cocaine users before and after drug cessation. *Drug and Alcohol Dependence,
96*(3), 286–289.

Buckley, T. C., Parker, J. D., & Heggie, J. (2001). A psychometric evaluation of the BDI-II in treatment-seeking substance abusers. *Journal of Substance Abuse Treatment, 20*(3), 197–204.

Bullers, S., Cooper, M. L., & Russell, M. (2001). Social network drinking and adult alcohol involvement: A longitudinal exploration of the direction of influence. *Addictive Behaviors, 26*(2), 181–199.

Clair, R., Gordon, M., Kroon, M., & Reilly, C. (2021). The effects of social isolation on well-being and life satisfaction during pandemic. *Humanities and Social Sciences Communications, 8*(1), 1-6.

Combine Study Research Group. (2003). Testing combined pharmacotherapies and behavioral interventions in alcohol dependence: rationale and methods. *Alcoholism: Clinical and Experimental Research, 27*(7), 1107–1122.

Cooney, N. L., Litt, M. D., Cooney, J. L., Pilkey, D. T., Steinberg, H. R., & Oncken, C. A. (2009). Alcohol and tobacco cessation in alcohol-dependent smokers: Analysis of real-time reports. *Psychology of Addictive Behaviors, 21*(3), 277–286.

Copello, A., Orford, J., Hodgson, R., Tober, G., Barrett, C., & UKATT Research Team (2002). Social behaviour and network therapy: basic principles and early experiences. *Addictive Behaviors, 27*(3), 345–366.

Copello. A., & Walsh, K. (2018). Families, friends and addiction: Impacts, psychological models and interventions. In Davis, P., Paton, B., & Jackson, S. (Eds.), *Addictions, psychology and treatment.* New York, NY: John Wiley & Sons Ltd.

Day, E., Copello, A., Karia, M., Roche, J., Grewal, P., George, S., . . . Chohan, G. (2013). Social network support for individuals receiving opiate substitution treatment and

its association with treatment progress. *European Addiction Research, 19*(4),
211–221.

Fatseas, M., Serre, F., Alexandre, J. M., Debrabant, R., Auriacombe, M., & Swendsen, J.
(2015). Craving and substance use among patients with alcohol, tobacco, cannabis
or heroin addiction: A comparison of substance-and person-specific cues.
Addiction, 110(6), 1035–1042.

French, M. T., Mortensen, K., & Timming, A. R. (2020). Changes in self-reported health,
alcohol consumption, and sleep quality during the COVID-19 pandemic in the
United States. *Applied Economics Letters*, 1–7.

Harding, J. (2018). *Qualitative data analysis: From start to finish*. London, UK: Sage.

Hennink, M., Hutter, I., & Bailey, A. (2020). *Qualitative research methods*. London, UK:
Sage.

Hussong, A. M., Hicks, R. E., Levy, S. A., & Curran, P. J. (2001). Specifying the relations
between affect and heavy alcohol use among young adults. *Journal of Abnormal
Psychology, 110*(3), 449–461.

Irimata, K., Wakim, P., & Li, X. (2018). *Estimation of correlation coefficient in data with
repeated measures.* Paper presented at the Proceedings of the SAS Global Forum.

Kirke, D. M. (2004). Chain reactions in adolescents' cigarette, alcohol and drug use:
similarity through peer influence or the patterning of ties in peer networks? *Social
Networks, 26*(1), 3–28.

Larimer, M. E., Palmer, R. S., & Marlatt, G. A. (1999). Relapse prevention: An overview
of Marlatt's cognitive-behavioral model. *Alcohol Research & Health, 23*(2), 151.

Latkin, C. A., Knowlton, A. R., Hoover, D., & Mandell, W. (1999). Drug network

characteristics as a predictor of cessation of drug use among adult injection drug

users: a prospective study. *The American Journal of Drug and Alcohol Abuse,
25*(3), 463–473.

Legard, R., Keegan, J., & Ward, K. (2003). *Qualitative research Practice: A guide for

social science students and researchers.* London, UK: Sage.

Levitt, H. M., Motulsky, S. L., Wertz, F. J., Morrow, S. L., & Ponterotto, J. G. (2017).

Recommendations for designing and reviewing qualitative research in

psychology: Promoting methodological integrity. *Qualitative Psychology, 4*(1),

2–22.

Litt, M. D., Cooney, N. L., & Morse, P. (1998). Ecological momentary assessment (EMA)

with treated alcoholics: Methodological problems and potential solutions. *Health

Psychology, 17*(1), 48–52.

Litt, M. D., Kadden, R. M., Kabela-Cormier, E., & Petry, N. M. (2009). Changing

network support for drinking: network support project 2-year follow-up. *Journal

of Consulting and Clinical Psychology*, 77(2), 229–242.

Longabaugh, R., Beattie, M., Noel, N., Stout, R., & Malloy, P. (1993). The effect of social

investment on treatment outcome. *Journal of Studies on Alcohol, 54*(4), 465–478.

Longabaugh, R., Wirtz, P. W., Zywiak, W. H., & O'Malley, S. S. (2010). Network support

as a prognostic indicator of drinking outcomes: The COMBINE study. *Journal of

Studies on Alcohol and Drugs, 71*(6), 837–846.

Marlatt, G. A., & Gordon, J. R. (1985). *Relapse Prevention: Maintenance Strategies in

the Treatment of Addictive Behaviors.* New York: Guilford Press.

McCaul, M. E., Hutton, H. E., Stephens, M. A. C., Xu, X., & Wand, G. S. (2017). Anxiety, anxiety sensitivity, and perceived stress as predictors of recent drinking, alcohol craving, and social stress response in heavy drinkers. *Alcoholism: Clinical and Experimental Research, 41*(4), 836–845.

McMillan, C., Felmlee, D., & Osgood, D. W. (2018). Peer influence, friend selection, and gender: How network processes shape adolescent smoking, drinking, and delinquency. *Social Networks, 55*, 86–96.

Meisel, M. K., Clifton, A. D., MacKillop, J., & Goodie, A. S. (2015). A social network analysis approach to alcohol use and co-occurring addictive behavior in young adults. *Addictive Behaviors, 51*, 72–79.

Nutt, D. J., King, L. A., & Phillips, L. D. (2010). Drug harms in the UK: a multicriteria decision analysis. *The Lancet, 376*(9752), 1558–1565.

Office for National Statistics. (2021). *Quarterly alcohol-specific deaths in England and Wales: 2001 to 2019 registrations and Quarter 1 (Jan to Mar) to Quarter 4 (Oct to Dec) 2020 provisional registrations.* Retrieved from https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/

Orford, J., Hodgson, R., Copello, A., John, B., Smith, M., Black, R., . . . Kerr, C. (2006). The clients' perspective on change during treatment for an alcohol problem: qualitative analysis of follow-up interviews in the UK alcohol treatment trial. *Addiction, 101*(1), 60-68.

Peirce, R. S., Frone, M. R., Russell, M., Cooper, M. L., & Mudar, P. (2000). A
longitudinal model of social contact, social support, depression, and alcohol use.
Health Psychology, 19(1), 28–38.

Pollard, M. S., Tucker, J. S., & Green, H. D. (2020). Changes in adult alcohol use and
consequences during the COVID-19 pandemic in the US. *JAMA Network Open,
3*(9), e2022942-e2022942.

Project MATCH Research Group. (1998). Matching alcoholism treatments to client
heterogeneity: Project MATCH three-year drinking outcomes. *Alcoholism:
Clinical and Experimental Research, 22*(6), 1300–1311.

Pryce, R., Buykx, P., Gray, L., Stone, T., Drummond, C., & Brennan, A. (2017).
*Estimates of alcohol dependence in England based on APMS 2014, including
estimates of children living in a household with an adult with alcohol dependence:
Prevalence, trends and amenability to treatment.* London: Public Health England.

Public Health England. (2021). *Wider Impacts of COVID-19 on Health (WICH)
summary, 15 April 2021.* Retrieved from
https://analytics.phe.gov.uk/apps/covid-19-indirect-effects/

Rickard, N., Arjmand, H.-A., Bakker, D., & Seabrook, E. (2016). Development of a
mobile phone app to support self-monitoring of emotional well-being: a mental
health digital innovation. *JMIR Mental Health, 3*(4), e6202.

Room, R., Babor, T., & Rehm, J. (2005). Alcohol and public health. *The Lancet,
365*(9458), 519–530.

Serre, F., Fatseas, M., Debrabant, R., Alexandre, J.-M., Auriacombe, M., & Swendsen, J.
(2012). Ecological momentary assessment in alcohol, tobacco, cannabis and

opiate dependence: A comparison of feasibility and validity. *Drug and Alcohol Dependence, 126*(1-2), 118–123.

Shiffman, S. (2009). Ecological momentary assessment (EMA) in studies of substance use. *Psychological Assessment, 21*(4), 486–497.

Skule, C., Ulleberg, P., Lending, H. D., Berge, T., Egeland, J., Brennen, T., & Landrø, N. I. (2014). Depressive symptoms in people with and without alcohol abuse: factor structure and measurement invariance of the Beck Depression Inventory (BDI-II) across groups. *PLoS ONE, 9*(2), e88321.

Stout, R. L., Kelly, J. F., Magill, M., & Pagano, M. E. (2012). Association between social influences and drinking outcomes across three years. *Journal of Studies on Alcohol and Drugs*, *73*(3), 489–497.

Swendsen, J. D., Tennen, H., Carney, M. A., Affleck, G., Willard, A., & Hromi, A. (2000). Mood and alcohol consumption: an experience sampling test of the self-medication hypothesis. *Journal of Abnormal Psychology, 109*(2), 198–204.

Trull, T. J., & Ebner-Priemer, U. W. (2009). Using experience sampling methods/ecological momentary assessment (ESM/EMA) in clinical assessment and clinical research: Introduction to the special section. *Psychological Assessment, 21*(4), 457–462.

Williams, R., Alexander, G., Armstrong, I., Baker, A., Bhala, N., Camps-Walsh, G., . . . Dhawan, A. (2018). Disease burden and costs from excess alcohol consumption, obesity, and viral hepatitis: fourth report of the Lancet Standing Commission on Liver Disease in the UK. *The Lancet, 391*(10125), 1097–1107.

Witkiewitz, K., & Marlatt, G. A. (2004). Relapse prevention for alcohol and drug

problems: that was Zen, this is Tao. *American Psychologist, 59*(4), 224–235.

Zywiak, W. H., Longabaugh, R., & Wirtz, P. W. (2002). Decomposing the relationships

between pretreatment social network characteristics and alcohol treatment

outcome. *Journal of Studies on Alcohol, 63*(1), 114–121.

Zywiak, W. H., Neighbors, C. J., Martin, R. A., Johnson, J. E., Eaton, C. A., & Rohsenow,

D. J. (2009). The Important People Drug and Alcohol interview: Psychometric

properties, predictive validity, and implications for treatment. *Journal of

Substance Abuse Treatment, 36*(3), 321–330.

Public Dissemination Document

The present thesis focuses on alcohol use disorders (i.e., serious alcohol problems) and their links with social networks and relationships. Alcohol use disorders are linked to more than 60 medical conditions and are reported to cause more harm than illicit drugs. Ways of understanding relapse to drinking and relapse prevention (Marlatt and Gordon, 1985) highlight the role of interpersonal events, and the behaviours and attitudes of those around us, in the maintenance or cessation of alcohol use. Despite this, there remain notable gaps in research understanding surrounding alcohol use disorders and social networks.

Literature Review: The effect of network and significant-other involvement on interventions for alcohol use disorders: A meta-analysis.

In the present literature review (*The effect of network and significant-other involvement on interventions for alcohol use disorders: A meta-analysis*), the author assesses the efficacy of alcohol-use disorder psychosocial treatments which incorporate or involve 'significant others' (i.e., families) and social networks, when compared to non-network-based active treatments. Systematically searching for papers across six research databases and reviewing 4,539 titles and abstracts, the author found 20 randomised control trials – regarded the highest quality of scientific evidential design – which compared network interventions to non-network controls.

Using a scientific method to compare results across studies, called meta-analysis, the results revealed small but significant advantages of network-based interventions over

non-network-based controls in increasing the number of days that those receiving the treatments were abstinent from alcohol. The analysis found stronger effects at six and 12-months after treatment, indicating lasting benefits. The effects were found to be consistent irrespective of intervention type, and were consistent regardless of population sex, age, baseline alcohol usage or the number of sessions offered. The benefit of network-based interventions was lower when controls involved networks even in very small ways, suggesting that even minimal network involvement may improve treatment efficacy.

The meta-analysis has significant implications for clinical work, providing a rationale for clinicians to engage the families and social networks of service users in the treatment of alcohol use disorders. The meta-analysis further provides a rationale for future research focusing on network-based interventions, and provides a number of recommendations to improve consistency and quality among future publications.

Empirical Paper: The impact of social network contact on recovery from alcohol problems: a pilot case series

In the present pilot (*The impact of social network contact on recovery from alcohol problems: a mixed methods pilot case series including experience sampling methodology.*), a mixed methods case series design, was used to explore the impact of a person's social network contact on their recovery from alcohol problems. Six participants, currently in treatment for alcohol-use disorders took part in the study. The case series presented a comprehensive exploration of the research question focusing on three important areas; (a) the composition of the participants' networks, (b) the impact of

ongoing contacts on daily fluctuations in confidence to abstain and temptation to drink, and (c) the person's perceived impact of networks on their alcohol usage and cessation.

Where previous studies have looked at broad patterns between earlier network composition and later prognosis, the present case series – a precursor to a larger study – focused on the impact of specific contacts on a day-to-day basis; addressing an important gap within the scientific research literature.

Having mapped out their social networks and explored the drink-related behaviours and attitudes of their network members, participants downloaded a custom-made smartphone app (Social Networks and Alcohol Recovery app; SoNAR). This app notified them twice-daily to record their rating of their temptation to drink and confidence to refrain, their alcohol consumption, and their recent contact with their network members. Qualitative interviews and thematic analysis explored the relationship between these variables while testing this novel method of data collection.

Due to difficulties recruiting as a result of restrictions imposed during Covid-19, the present study did not have sufficient participants and data to conduct mixed-effects quantitative analysis or timeseries analysis. As such statistical analysis could not be validly conducted.

Thematic analysis revealed themes across participants relating to the ways in which social networks can impact on recovery from alcohol problems. Participants spoke about the ways in which network drinkers can increase temptation (deliberately or naively), which was often related to network members' awareness of the problem and motivation to reduce intake. Conversely, participants also spoke about how networks

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provide encouragement and support, and the unique contribution of others in recovery. Themes surrounding the availability of the network, loneliness, and relationship difficulties were also presented. Taken together, the study provides evidence for mechanisms which link network composition and activity to alcohol-related outcomes.

Taking place at an unprecedent time, the paper further explores with participants the impact of Covid-19 and lockdown restrictions on recovery from alcohol-use disorders. Participants described a range of experiences. Themes relating to the reduced availability of drinking networks – a positive influence – were noted, alongside greater difficulties with regards to boredom, loneliness and access to supportive networks.

Concluding remarks

Taken together, the meta-analysis and case series provide a coherent and substantial addition to the literature on alcohol-use disorders. They highlight the importance of social networks and significant others in the maintenance and cessation of alcohol use. The empirical paper provides evidence linking network behaviours and attitudes to participants' experienced levels of temptation to drink on a day-to-day basis using a novel methodology. The literature review highlights the importance of network involvement in the treatment of alcohol-use disorders in professional services. Together, the two papers have important implications both for future research and for clinical practice.

Appendices for Volume I: Literature Review

Appendix 1

Search terms used in the Cochrane Database.

Alcohol Terms Terms relating to alcohol use, combined using OR function.	'alcohol-related disorders (MeSH exp)' OR 'alcohol*'
Network Terms Terms relating to networks and families, combined using OR function.	'couple*' OR 'partner*' OR 'spous*' OR 'marital*' OR 'married' OR 'conjoint*' 'significant other' OR 'CSO' 'famil*' OR 'family system*'
Intervention Terms Terms relating to interventions, combined using OR function.	'treatment*' OR 'intervention*' OR 'therap*' OR 'counsel*' OR 'skills training'
Known Interventions Terms relating to known network therapies, combined using OR function.	'behavioural couples' OR 'behavioral couples' 'network therapy' 'SBNT' OR 'social behaviour' OR 'social behavior' 'community reinforcement approach' OR 'community-reinforcement approach' family therapy (MeSH exp)
Trial Terms Terms referencing being a trial, combined using OR function.	'randomized controlled trial (MeSH exp)' OR 'random allocation (MeSH exp)' 'treatment outcome (MeSH exp)' 'research design (MeSH exp)'

MeSH Exp = 'Medical Subject Headings exploded in database'

Appendix 2

Assessment of study bias according to Higgins' et al. (2011) Risk of Bias tool.

Entry	Judgement	Support for Judgement
Barber 1995		
Random Sequence Allocation	Unclear	"*Clients were randomly assigned to one of three conditions*" No description of randomisation
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	High Risk	No description of dropout or analysis for missing data
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Bowers 1990		
Random Sequence Allocation	Unclear	"*Sixteen couples…were randomly assigned*" No description of randomisation.
Allocation Concealment	High Risk	"*Prior to active involvement in treatment, the clients were asked to sign consent forms agreeing to participate in the treatment program*" Appears as though consent obtained post-allocation
Blinding of Participants and Personnel	High Risk	"*Both conditions were administered by the same two therapists, with no expectation that either treatment was superior to the other. The therapists administering the treatments were not the researchers in this study and were blind to the nature of the hypotheses under investigation.*" Lack of expectation/preference is unlikely.
Blinding of Outcome Assessment	High Risk	"*The posttreatment and 6-month follow-up was conducted by Dr. Bowers, but the 1-year follow-up was conducted by an interviewer blind to both the hypotheses under investigation and the nature of the treatment received.*" "*The alcohol consumption was measured by a self-report questionnaire*"

		Self-report and unblinded assessment at 6 months.
Incomplete Data	Low Risk	"*Complete data were available for the 16 couples on 1-month posttreatment assessment*" "*All of the alcoholics were assessed at 6-month follow-up*" "[In three of four missing cases at 1 year] *spouses estimated that they continued to drink at a similar level, so the 6-month drinking was used as an estimate of 1-year.*" Limited missing data, low risk. Use of Last Observation Carried Forward (LOCF) justified by authors.
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Hartmann 2020		
Random Sequence Allocation	Low Risk	"*randomized at the couple level…using a random number generator*"
Allocation Concealment	Low Risk	"*During the orientation session, the randomization assignment was revealed to the couple using a sealed envelope with their study identification number.*"
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	Low Risk	An objective measurement is used: negative/positive breathalyser tests
Incomplete Data	High Risk	"*Our results may also be subject to missing data bias. Missed breathalyzer tests are most likely not missing at random*".
Selective Reporting	High Risk	"*a mixed-effect logistic regression model was used to estimate the proportion of negative BrAC tests per arm*" Estimated proportion of may indicate selective reporting of the effect.
Other Bias	-	-
Lam 2009		
Random Sequence Allocation	Unclear	"*Random assignment was effective*" No description of randomisation
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel

Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	High Risk	"*Procedures for data imputation in multilevel models described in Goldstein (2003) were used to address missing data.*" 17% of participants with missing data. Imputation used but prone to bias.
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Litt 2007	
Random Sequence Allocation	Low Risk	"*We randomly assigned…using a computerized urn randomization procedure*"
Allocation Concealment	Unclear	"*Participants were informed of their treatment assignment by a research assistant at intake*". Allocation concealment not described.
Blinding of Participants and Personnel	High Risk	"*Given the procedures used in each treatment, participants, therapists, and research assistants could not be blinded as to experimental condition*"
Blinding of Outcome Assessment	High Risk	"*Given the procedures used in each treatment, participants, therapists, and research assistants could not be blinded as to experimental condition*"
Incomplete Data	High Risk	Dropouts were excluded from the analysis, with unequal dropouts across treatment arms. Reasons not given.
Selective Reporting	Low Risk	Raw data obtained from main author.
Other Bias	-	-
Longabaugh 1995	
Random Sequence Allocation	Low Risk	Urn randomisation described
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding

Incomplete Data	High Risk	Intention to treat analysis with unaccounted variability between conditions in terms of drop out.
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	High Risk	Concerns about the implementation of the interventions as planned - 84% of the CBT cohort included in ITT analysis met minimal criteria of attending at least 1 CBT treatment session; 56% of the ERE cohort met minimal criteria which was to attend at least one partner session and one CBT session.
McCrady 1979		
Random Sequence Allocation	Unclear	"*They were randomly assigned*" No description of randomisation
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	Unclear	No reference to blinding
Incomplete Data	High Risk	Dropouts present, but no description of dropouts or reason
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
McCrady 1986		
Random Sequence Allocation	Low Risk	Urn randomisation described. Discussion details unequal characteristics across treatment arms, however.
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	High Risk	Higher dropout noted in minimal-spouse-involvement condition with remaining participants demonstrating better outcomes

Selective Reporting	High Risk	Standard deviations not reported. Effect sizes reverse-engineered from the statistic which were reported. Some statistics not reported.
Other Bias	-	-
McCrady 2009		
Random Sequence Allocation	Low Risk	"*A research assistant created equal numbers of sealed envelopes with cards listing each treatment condition. The baseline interviewer drew an envelope randomly to assign treatment condition.*"
Allocation Concealment	Unclear	"*When the baseline assessment was completed participants were…informed of their treatment assignment so that they could schedule their first treatment session*" Allocation concealment unclear
Blinding of Participants and Personnel	High Risk	"*Because the treatment was a psychosocial treatment, guided by treatment manuals, blinding of the therapists and participants was not possible.*" Personnel not blinded
Blinding of Outcome Assessment	High Risk	"*During follow-up, we were not able to blind interviewers to treatment condition*"
Incomplete Data	High Risk	"*treating missing data as negative outcomes*" "*We modelled missing data using the expectation maximization method with the maximum likelihood estimator.*" Imputation of data and assumption of negative outcome may be prone to bias.
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Monti 1990		
Random Sequence Allocation	High Risk	"*Patients were treated in cohorts. Every 4 weeks, a cohort of patients started standard treatment and received one of the experimental treatments. Twelve cohorts completed the program…four receiving each of the experimental treatments, in random order*"
Allocation Concealment	High Risk	Randomisation procedure involves cohort-based allocation; thus, concealment is unlikely.
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding

Incomplete Data	High Risk	"*missing self-report data lead to variability in n across tests*" No account of dropouts given.
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Monti 2014	
Random Sequence Allocation	Low Risk	"*Use of an urn randomization procedure ensured balance across conditions on the following factors*"
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	Low Risk	"*Participant follow-up assessments were conducted at 6 and 12 months by trained research assistants masked to intervention condition*"
Incomplete Data	Unclear Risk	"*While the GEE analyses analyze all available data and accommodate missing data, there were 36 individuals who either had no follow-up data or had one follow-up data point but were missing a baseline covariate.*" "*Patients who completed both follow-up assessments…did not differ significantly from patients who had missed a follow up*"
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Nattala 2010	
Random Sequence Allocation	Low Risk	Urn randomisation described
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	"*Participants and family members were then administered written informed consent…and were informed that they would be randomized to one of three treatment conditions*" Unclear whether participants are aware of the other conditions.
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding

| Incomplete Data	High Risk	"*Three participants from TAU were not included in the analyses because they were not available for follow-up after discharge.*" No account of dropouts given.
Selective Reporting	High Risk	Change scores reported; raw data not reported.
Other Bias	High Risk	"*There were no refusals for participation, because in India patients often rely on the health professional's prescription of treatment.*" Absence of alternative treatment may indicate coerced participation.
Neto 2008		
Random Sequence Allocation	Low Risk	"A computer-generated random numbers list was used to allocate to the two groups."
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	High Risk	No blinding – described as 'open trial'
Blinding of Outcome Assessment	Low Risk	Assessment conducted by "*one of two independent assessors (ignorant to the treatment group)*"
Incomplete Data	High Risk	"*In other statistical analysis, loss to follow-up was regarded as relapse (intention to treat method)*" Assumption that dropout means relapse may be prone to bias. No accounts of dropouts given.
Selective Reporting	Low Risk	Table of raw data provided.
Other Bias	-	-
O'Farrell 1985		
Random Sequence Allocation	Low Risk	"*Couples were assigned…by a random numbers table*"
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	High Risk	Unequal drop out noted between treatment arms, reportedly related to treatment outcome.

Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Orford 2005 (UKATT)		
Random Sequence Allocation	Low Risk	"*The remote randomisation service at York used a computer "online" to allocate consenting participants between therapy groups, stratified by site*"
Allocation Concealment	Unclear	"*Treatment was concealed until allocation.*" No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	Unclear	"*At 12 months we employed a new team of interviewers to ensure that they were blind to treatment allocation. We did not have the resources to do this at three months*" Unblinded assessors at 3 months.
Incomplete Data	High Risk	"*Of 125 participants lost to follow-up at 12 months, 12 had died, 35 did not respond, and 78 could not be traced or contacted*" Last Observation Carried Forward (LOCF) used. LOCF is prone to bias. 78 uncontactable participants represent significant dropout.
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Schumm 2014		
Random Sequence Allocation	Low Risk	Urn randomisation described
Allocation Concealment	Low Risk	"*Treatment assignment was concealed from participants until they arrived for their first treatment session*"
Blinding of Participants and Personnel	High Risk	"*Therapists provided treatment in both the BCT and the IBT conditions*" Personnel not blinded
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	Low Risk	Low drop out rate, balanced across both conditions. Reasons not given, however.
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Slesnick 2016		

Random Sequence Allocation	Unclear	No description of randomisation
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	Low Risk	Study used an intent-to-treat design which consisted of the entire sample of 183 mothers, relatively equal dropout across conditions, reasons given.
Selective Reporting	Low Risk	Raw data provided upon request
Other Bias	-	-
Sobell 2000		
Random Sequence Allocation	Unclear	No description of randomisation
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	Unclear	"*The assessment was conducted at a centralized unit by assessment workers who were not involved in the treatment.*" Self-reported outcomes, unclear whether assessors were blinded.
Incomplete Data	High Risk	"*The 21 clients who dropped out...slightly more polysubstance abuse and somewhat lesser vocational skills among the drop-outs.*" Drop out associated with relevant characteristics
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Vedel 2008		
Random Sequence Allocation	Unclear	No description of randomisation
Allocation Concealment	Unclear	No description of allocation procedures

| Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	High Risk	Dropouts only discussed in discussion where they are referred to as treatment failures
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-
Walitzer 2004		
Random Sequence Allocation	Unclear	No description of randomisation
Allocation Concealment	Unclear	No description of allocation procedures
Blinding of Participants and Personnel	Unclear	No reference to blinding of participants or personnel
Blinding of Outcome Assessment	High Risk	Self-reported outcomes, no reference to blinding
Incomplete Data	Unclear	Spouse reports, where available, substituted missing data
Selective Reporting	Low Risk	Table of raw data provided
Other Bias	-	-

Appendix 3

Forest plot for abstinence measures at post-treatment, 6-month follow-up and 12-month
follow-up, after the removal of McCrady 1986 at 6 months.
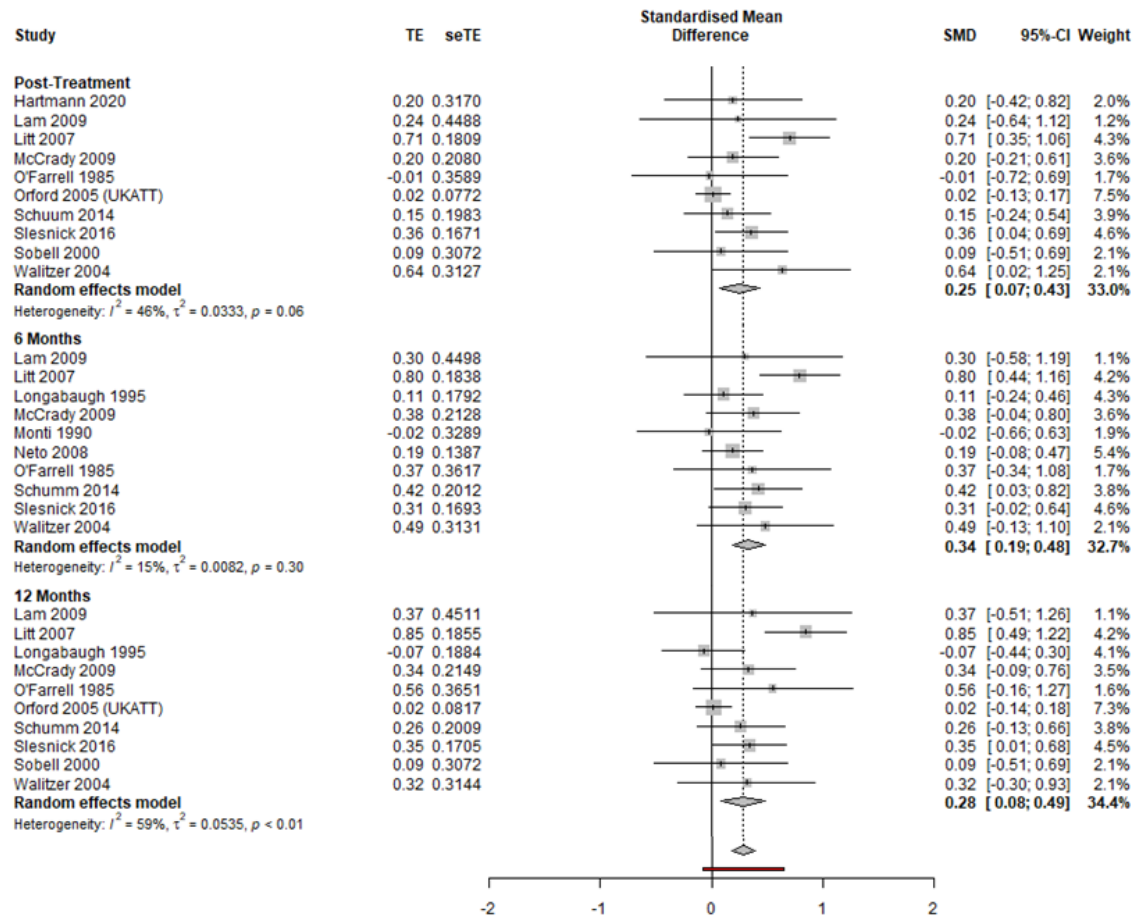
Appendix 4

QQ plots of the distribution of the standardised mean difference of outcomes relating to the quantity of alcohol consumed per week at (a) post-treatment, (b) 6-month follow-up, and (c) 12-month follow-up.
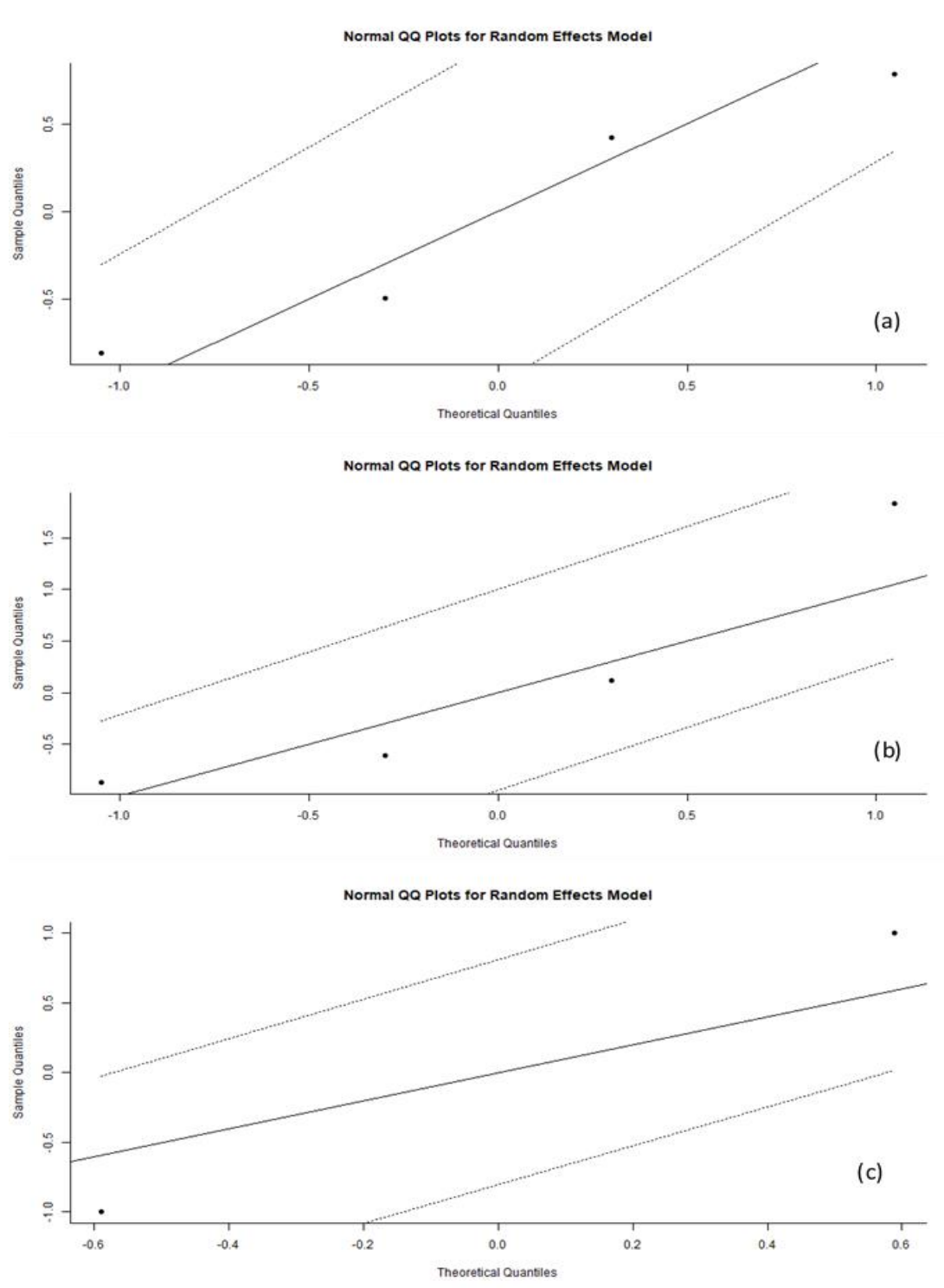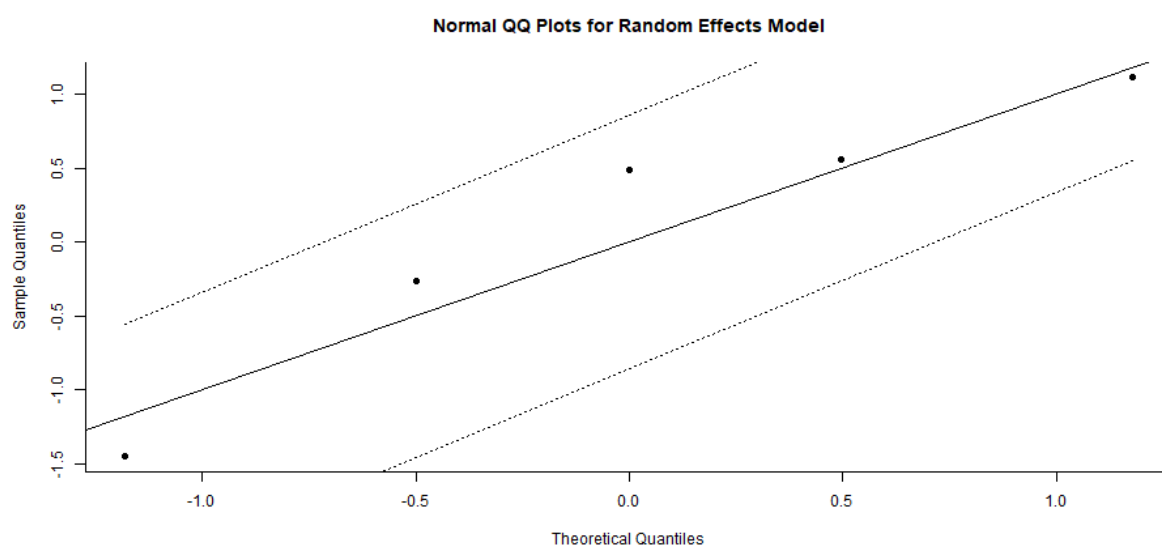
Appendix 5

Treatment effects of primary studies reporting outcomes for quantity of alcohol consumed per week.

Study	SMD	Lower 95%-CI	Upper 95%-CI	%W (Fixed)	%W (Random)
Post-treatment					
Barber 1995	0.0496	-0.8271	0.9262	20.3	20.3
Bowers 1990	-0.1248	-1.1057	0.8562	16.3	16.3
McCrady 1979	0.6086	-0.3806	1.5979	16.0	16.0
Vedel 2008	0.3360	-0.2382	0.9103	47.4	47.4
6-month follow-up					
Bowers 1990	1.1632	0.1036	2.2228	3.2	11.8
McCrady 1979	-0.2016	-1.1785	0.7752	3.8	13.4
Monti 2014	-0.0661	-0.2757	0.1436	82.9	49.3
Vedel 2008	0.1607	-0.4421	0.7636	10.0	25.4
12-month follow-up					
Bowers 1990	1.6830	0.5426	2.8233	3.3	43.3
Monti 2014	0.1145	-0.0953	0.3242	96.7	56.6

Appendix 6

QQ plot of the distribution of the standardised mean difference of outcomes relating to drinks per drinking day (DPDD) across all timepoints.


Normal QQ Plots for Random Effects Model

Appendix 7

Treatment effects of primary studies reporting outcomes for drinks per drinking day
(DPDD).

Study	SMD	Lower 95%-CI	Upper 95%-CI	%W (Fixed)	%W (Random)
Litt 2007	0.3355	-0.0134	0.6844	16.7	24.5
Monti 1990	0.3816	-0.2689	1.0321	4.8	11.9
Neto 2008	0.5738	-0.0031	1.1506	6.1	14.1
Orford 2005	-0.0598	-0.2341	0.1145	66.8	36.1
Sobell 2000	0.1102	-0.4921	0.7126	5.6	13.3

Appendix 8

QQ plots of the distribution of the standardised mean difference of outcomes relating to
the proportion of people categorised as abstinent at (a) post-treatment, (b) 6-month
follow-up, and (c) 12-month follow-up.
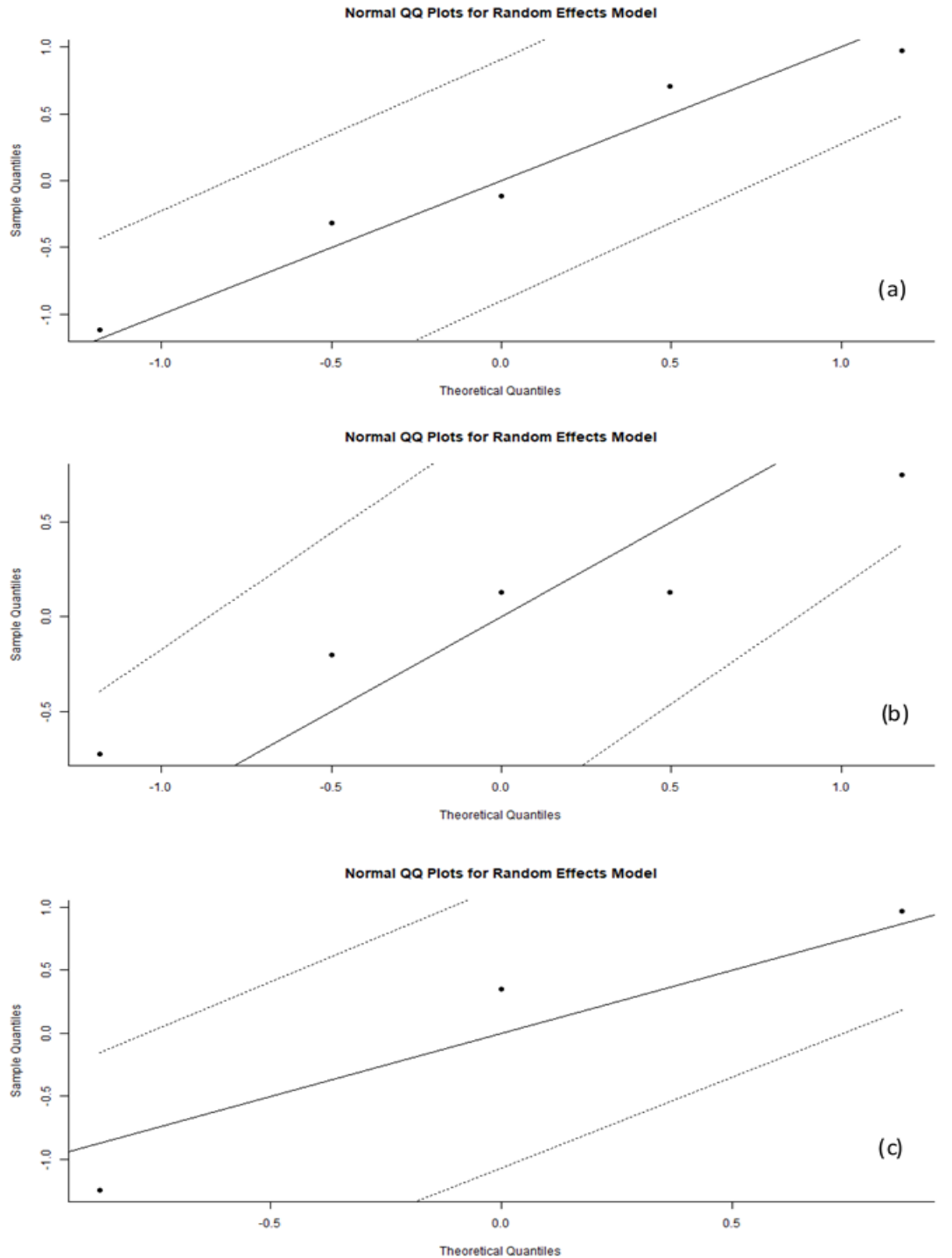
Appendix 9

Treatment effects of primary studies reporting outcomes for the proportion of participants who were categorised as abstinent.

Study	SMD	Lower 95%-CI	Upper 95%-CI	%W (Fixed)	%W (Random)
Post-treatment					
Litt 2007	0.2509	-0.2685	0.7702	26.1	26.1
McCrady 1979	0.0331	-0.9435	1.0097	7.4	7.4
Vedel 2008	-0.2277	-0.8425	0.3871	18.6	18.6
McCrady 2009	0.0327	-0.4076	0.4721	36.5	36.5
O'Farrell 1985	0.4561	-0.3293	1.2415	11.4	11.4
6-month follow-up					
Bowers 1990	0.3409	-0.9164	1.5982	3.3	3.3
Litt 2007	0.3353	-0.0899	0.7606	28.5	28.5
McCrady 1979	0.5316	-0.4545	1.5178	5.3	5.3
Natalla 2010	0.6709	0.0933	1.2486	15.5	15.5
Neto 2008	0.4841	0.1543	0.8138	47.4	47.4
12-month follow-up					
Bowers 1990	0.4981	0.5227	1.5188	9.9	9.9
Litt 2007	0.4581	0.0366	0.8795	58.2	58.2
McCrady 2009	0.0252	-0.5436	0.5940	31.9	31.9

Appendices for Volume I: Empirical Study

Appendix 1

The adapted Important People in Drugs and Alcohol Interview.

Adapted Important People in Drugs and Alcohol Interview

Date: Participant ID: Interviewer:

I am going to ask you about the people you have spent the most time with in the past 3 months, and are likely to see in the next 2 weeks. These people may be anyone over the age of 12 years old, and may include family members, friends, drinking buddies, people from work, club members, or anyone that you interact with, regardless of whether or not you like them.

| 1) Name	2) Relationship	3) During the past 3 months on average, how frequently have you been in contact with....?	4) How important has this person been to you?	5) Generally supportive of you?	6) Alcohol use?	7) How often does this person drink alcohol? OR: How would this person react to your drinking?	8) How has this person reacted to your drinking?	9) How has this person felt about your coming for treatment?

(First name and last initial, or nickname)	Write # and specify
	1 = partner
	2 = immediate family
	3 = extended family
	4 = friend
	5 = from work
	6 = self-help/treatment
	7 = other
		7 = daily
		6 = 3 to 6 times/week
		5 = once or twice a week
		4 = every other week
		3 = about once/month
		2 = less than monthly
		1 = once in the past 3 months
			6 = extremely important
			5 = very important
			4 = important
			3 = somewhat important
			2 = not very important
			1 = not at all important
				6 = extremely supportive
				5 = very supportive
				4 = supportive
				3 = somewhat supportive
				2 = not very supportive
				1 = not at all supportive
					5 = uses a lot
					4 = uses a moderate amount
					3 = uses a little
					2 = non-user
					1 = did use, now drink-free
					8 = don't know
						7 = daily
						6 = 3 to 6 times/week
						5 = once or twice a week
						4 = every other week
						3 = about once/month
						2 = less than monthly
						1 = once in the past 3 months
						0 = not in the past 3 months
						8 = don't know
							6 = strongly encouraged it
							5 = supports it
							4 = accepted it
							3 = neutral
							2 = did not accept it
							1 = left, or made you leave when you are drinking
							8 = don't know
								6 = strongly supports it
								5 = supports it
								4 = neutral
								3 = mixed
								2 = opposes it
								1 = strongly opposes it
								8 = don't know how they would feel

1)								
2)								
3)								
4)								
5)								

Appendix 2

Individual participant analysis. Linear regressions: whether the attitudes and behaviours of contacts seen can predict temptation.

Participant	Multiple Regression: Network Attitudes			Multiple Regression: Network Drinking		
	Regression Model DV: Temptation	*IV: No. of Pro-drink Contacts Seen*	*IV: No. of Pro-abstinence Contacts Seen*	*Regression Model DV: Temptation*	*IV: No. of Drinkers Seen*	*IV: No. of Abstinent Contacts Seen*
1	R^2= .282, $F(2, 24)$ = 4.721, $p = 0.019$*	$\beta = -.318$, $p = 0.305$	$\beta = -.370$, $p = 0.009$*	R^2= .241, $F(2, 24)$ = 3.807, $p = 0.037$*	$\beta = -.129$, $p = 0.694$	$\beta = -.309$, $p = 0.011$*
2	R^2= .087, $F(1, 19)$ = 1.800, $p = 0.196$	-	$\beta = -.643$, $p = 0.196$	R^2= .087, $F(1, 19)$ = 1.800, $p = 0.196$	-	$\beta = -.643$, $p = 0.196$
3	R^2= .057, $F(2, 16)$ = 0.484, $p = 0.625$	$\beta = .280$, $p = 0.527$	$\beta = -.540$, $p = 0.350$	R^2= .052, $F(2, 16)$ = 0.453, $p = 0.655$	$\beta = -.174$, $p = 0.379$	$\beta = .174$, $p = 0.652$
4	R^2= .097, $F(2, 25)$ = 1.336, $p = 0.281$	$\beta = .317$, $p = 0.268$	$\beta = -.205$, $p = 0.197$	R^2= .136, $F(2, 25)$ = 1.968, $p = 0.161$	$\beta = .089$, $p = 0.554$	$\beta = -.862$, $p = 0.058$^
5	R^2= .035, $F(2, 21)$ = 0.376, $p = 0.691$	$\beta = -.317$, $p = 0.578$	$\beta = -.650$, $p = 0.491$	R^2= .055, $F(2, 21)$ = 0.611, $p = 0.552$	$\beta = -.205$, $p = 0.486$	$\beta = -.264$, $p = 0.491$
6	R^2= .024, $F(2, 33)$ = 0.402, $p = 0.672$	$\beta = -.060$, $p = 0.875$	$\beta = -.844$, $p = 0.39$	R^2= .001, $F(1, 34)$ = 0.044, $p = 0.835$	$\beta = -.079$, $p = 0.835$	-

Asterisk (*) indicates statistical significance at 95% confidence. ^ indicates trend towards significance
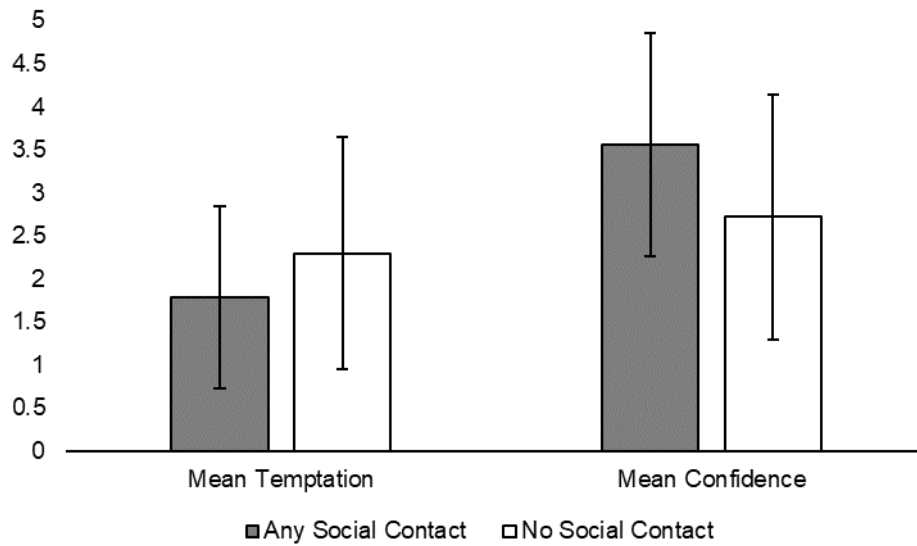
Appendix 3

Mean confidence and temptation when having been in contact with pro-drinking and pro-abstinence network members *(zero-contact events excluded)*.
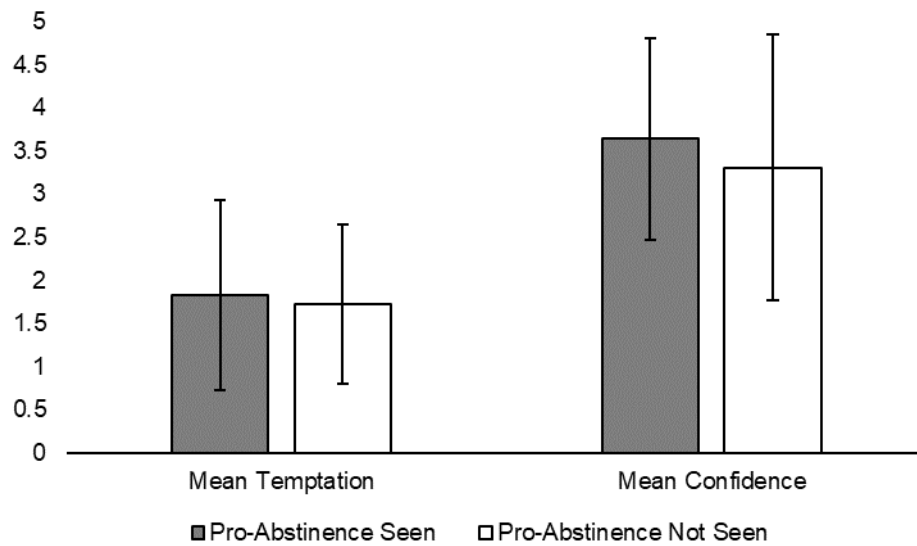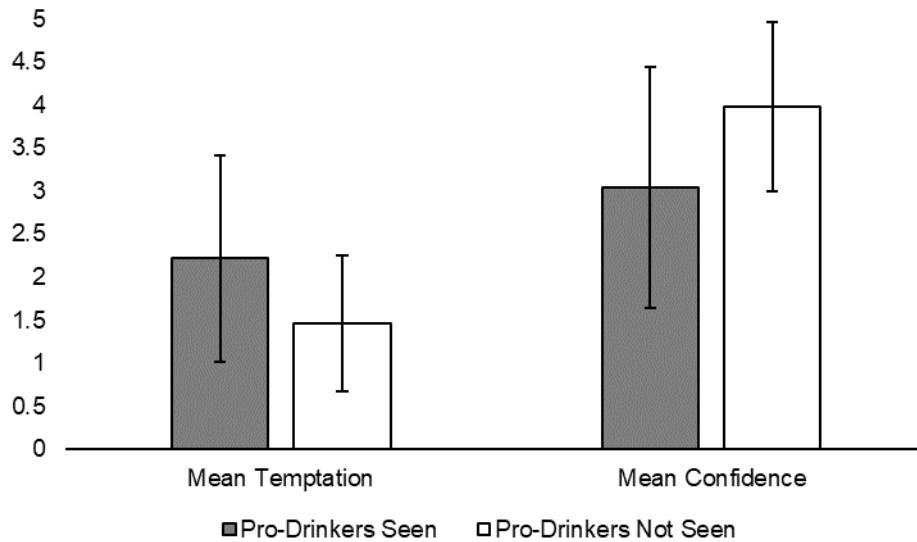
	Pro-drink contacts seen	**Pro-drink contacts not seen**	
Temptation	M = 2.22, SD = 1.2, n = 49	M = 1.42, SD = 0.77, n = 59	t (79) = -4.05, *p* < 0.001*
Confidence	M = 3.04, SD = 1.4, n = 50	M = 4.00, SD = 0.99, n = 58	t (86) = 4.02, *p* < 0.001*
	Pro-abstinence contacts seen	**Pro-abstinence contacts not seen**	
Temptation	M = 1.83, SD = 1.1, n = 81	M = 1.72, SD = 0.9, n = 29	t (106) = -0.68, *p* = 0.50
Confidence	M = 3.64, SD = 1.2, n = 81	M = 3.31, SD = 1.5, n = 29	t (36) = -1.04, *p* = 0.35

Appendix 4

	Any social contact	No social contact	
Temptation	M = 1.79, SD = 1.06, n = 108	M = 2.30, SD = 1.35, n = 47	t (71.7) = -2.30, p = 0.024*
Confidence	(M = 3.56, SD = 1.29, n = 108	M = 2.72, SD = 1.43, n = 47	t (153) = 3.57, p < 0.001 *

Appendix 5

***Qualitative Interview Schedule: Perceived influence of social network
contact on drinking****.*

Note for interviewer: *The aim of the interview is to start broadly and generally
exploring the participant's view of the influence of social networks and social
contacts on decisions to control, stop or continue drinking. The style involves
opening with a broad question in order to explore the participant's views and
experiences and using prompts where necessary. It is important to explore both
views of negative as well as unhelpful influences from the participant's viewpoint.
If the participant has answered a particular question in advance, there is no need
to repeat this. The second aim of the interview is to explore more specifically the
participant's experience during the study and of using the App.*

**Participant's perceptions of influences of other people in their social
network upon drinking in general**

1) What has been your experience of other people influencing your drinking,
generally?

Prompts:

- Do you think that other people influence whether or not you drink?
- Does this happen in specific ways?
- Has this changed before and after treatment?
- Has it changed over time irrespective of treatment?
- Can you think of examples?
- Have you experienced others influencing your temptation to drink? If so in
what ways?
- Have you experienced others influencing your confidence or ability to
reduce/control your drinking? If so in what ways?
  - Prompt both positive and negative influences

2) Thinking more specifically, how in your view might certain people impact your
temptation to drink alcohol?

  - Family
  - Partners
  - Friends
  - Colleagues
  - Treatment-contacts

  - o Others
- Do they influence your decision not to drink? In what ways? Can you give examples?
- What has been your experience of thinking about the influence of others on your drinking?
- Can you give me an example of when you may have thought about what/who influences your temptation to drink?

3) Are there things in your view that other people can do to support your efforts to control/reduce/stop your drinking and are not doing at present?

4) What has been the impact of Covid-19 on your temptation, confidence or drinking?

Experiences during the study

5) What has been your experience of others influencing your drinking <u>over the past two weeks</u>?

Prompt:

- [Showing the chart of temptation to drink over the past 2 weeks to prompt/highlight peaks and troughs]
  - o Looking at the chart, can you talk me through what you see? Are there any patterns you notice?
  - o OR (if they do not highlight specific areas, point to particular peaks or troughs): what was happening here?

Experience of the App

6) What was your experience of using the App over the past two weeks?
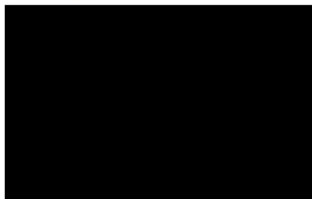
Prompts:

- How did you find using the app to record temptation and confidence?
- How did you find using the app to record social contact?
- What did you like about the app?
- What did you dislike about the app?
- Would you have any suggestions to improve the app?

Appendix 6

Ethical Approval

Ymchwil Iechyd
a Gofal Cymru
Health and Care
Research Wales

NHS
Health Research
Authority

Email: approvals@hra.nhs.uk
HCRW.approvals@wales.nhs.uk

04 May 2020

Dear

**HRA and Health and Care
Research Wales (HCRW)
Approval Letter**

Study title: The impact of social network contact on recovery from
alcohol problems

IRAS project ID:
Protocol number:
REC reference: 20/WM/0096
Sponsor

I am pleased to confirm that **HRA and Health and Care Research Wales (HCRW) Approval**
has been given for the above referenced study, on the basis described in the application form,
protocol, supporting documentation and any clarifications received. You should not expect to
receive anything further relating to this application.

Please now work with participating NHS organisations to confirm capacity and capability, <u>in
line with the instructions provided in the "Information to support study set up" section towards
the end of this letter</u>.

**How should I work with participating NHS/HSC organisations in Northern Ireland and
Scotland?**
HRA and HCRW Approval does not apply to NHS/HSC organisations within Northern Ireland
and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of
these devolved administrations, the final document set and the study wide governance report
(including this letter) have been sent to the coordinating centre of each participating nation.
The relevant national coordinating function/s will contact you as appropriate.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations?

HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

What are my notification responsibilities during the study?

The standard conditions document "*After Ethical Review – guidance for sponsors and investigators*", issued with your REC favourable opinion, gives detailed guidance on reporting expectations for studies, including:
- Registration of research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics, and is updated in the light of changes in reporting expectations or procedures.

Who should I contact for further information?

Please do not hesitate to contact me for assistance with this application. My contact details are below.

Your IRAS project ID is ███████ Please quote this on all correspondence.

Yours sincerely,

███████████

Approvals Specialist

Email: approvals@hra.nhs.uk

Copy to: ████████████