Social Psychiatry and Psychiatric Epidemiology

# Assessing the effectiveness of social network interventions for adults with a diagnosis of mental health problems: a systematic review and narrative synthesis of impact.

--Manuscript Draft--

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| **Abstract:** | Background: Social connections have been linked to the genesis and amelioration of mental health problems and thus have potential therapeutic value.<br>Purpose: To identify the current evidence base, assess risk of bias and synthesise findings on the effectiveness of social network interventions for people with mental health problems.<br>Methods: Electronic databases (MEDLINE, Embase, PsycINFO, CINAHL, Cochrane Library, Web of Science, Scopus) and grey literature databases were systematically searched from inception to August 2020 using free text syntax combining synonyms for 'mental health problems' and 'social network interventions'. Articles were eligible for inclusion if they reported data from randomised controlled trials on the effectiveness of interventions designed to improve social networks for adults (18+) with mental health problems. Papers were independently reviewed for inclusion with conflicts resolved through consensus. Included papers were quality assessed and data extracted and synthesised narratively. Risk of bias was assessed using the Cochrane Risk of Bias Tool.<br>Results: Nine studies randomising 2226 participants were included. Four focused on those with a diagnosis of schizophrenia or psychosis, one on major depressive |

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| | disorder and four included all types of mental health diagnoses. The current evidence base is of unclear quality. However, interventions which focused on supporting social activities appear to hold the most promise for enhancing social networks. Data on cost effectiveness and research acceptability were limited but suggest the potential economic feasibility of and acceptability for evaluating these interventions. Conclusion: There is emerging evidence that social network interventions can be effective in improving social connections for people with mental health problems. However, further evaluations with robust methodological approaches are required to inform evidence-based recommendation for health services. |

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Authors' Response to Reviewers' Comments
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Dr Kelly Anderson
Editor
Social Psychiatry and Psychiatric Epidemiology

Friday, 10th December 2021

Dear Dr Kelly Anderson

**RE: SPPE-D-21-00767. Article Title: Assessing the effectiveness of social network interventions for adults with a diagnosis of mental health problems: a systematic review and narrative synthesis of impact.**

Thank you for your email dated 10th November, for the helpful set of editor and reviewer comments and the requested revisions. We have now the revised the manuscript in line with the comments from the reviewers which we feel has strengthened the manuscript. Please find below a point-by-point response to each comment detailing how we have addressed each point raised.

Whilst our manuscript was under review, we have also updated our searches in order to reassure the editor and the reviewers about the currency of the review. The searches were updated in October and the manuscript and associated files have been updated accordingly.

**Editor Comments:**

**Please ensure that your main tables do not span across pages - Table 2 can be divided into three separate tables**

We have divided table 2 into three separate tables in line with editorial comments.

**Reviewer #1:**
**This is a well-constructed paper on an important topic. Social network interventions are increasingly proposed for mental health care, but there is insufficient evidence to guide policy makers. The authors have conducted a high-quality systematic review following PRISMA guidelines and using rigorous selection criteria. The subsequent narrative synthesis is thoughtfully critical, followed by a judicious discussion and useful recommendations for focused future research, including benefits of active PPI involvement.**

Thank you for this positive feedback.

**Minor comments:**

**1. While the overall argument in favour of social connectedness is well-made, is there any evidence that increasing social networks can sometimes have negative effects on mental health?**

We have now expanded the detail included in the introduction about the importance of network quality as well as network quantity and for the potential for negative aspects of social network contributions (page 3. Paragraph 3)

**2. There is ambiguity within the paper on associations between social networks and mental health symptomatology. Page 15 lines 28-49, and page 17 lines 28-9 both indicate no evidence of**

**relationships between the two. However page 19, line 55 says '....can improve symptomatology'. This needs clarification.**

We would like to thank the reviewer for highlighting this. We have now clarified this in the conclusion to align with the rest of the manuscript:

*We found preliminary evidence that social network interventions can be effective in improving social networks for people with mental health problems. However, this review demonstrates that evidence for social network interventions for people with mental health problems is in its infancy and further rigorous evaluation is required to inform evidence-based recommendation for health services. Future research should incorporate nested process evaluations in order to understand and optimise implementation, adequate patient and public involvement to increase intervention uptake and acceptability and high-quality cost data to allow in-depth economic modelling to be undertaken.*

**3. Further, if there are any association between enhanced social networks and reduced symptomatology, it is not clear what the causative pathways may be. For example, might reduced symptomatology lead to enhanced networks, rather than vice versa?**

Please see response to point 2. We apologise for this lack of clarity. As detailed in paragraph 2 of the discussion, our review identified that for those interventions that were effective in enhancing social networks these benefits did not routinely translate into improvements in mental health outcomes. We have made suggestions for further research to investigate whether there is an embedding period which is required which exceeded the follow-up periods in included studies. In the same paragraph we recommend further research examines any underlying mechanisms of action as it was not possible to identify these within included papers.

**Reviewer #2:**
**Thank you for the opportunity of contributing to the review of this manuscript. This is an interesting and clinically important study, in which the authors synthesized findings on the effectiveness of social network interventions for people with mental health problems in a systematic review. It is a clearly structured and well-written paper.**

Thank you for this positive feedback.

**I don't have any major concerns. However, the authors may wish to consider the following suggestions for minor revisions, which I hope will help strengthen the manuscript:**
**Introduction**

**p. 3 An individual's ability to obtain support from their social networks and negotiate its acceptability to themselves and other members of their network is impacted by existing cultures and available network and individual resources [8, 9] The authors raised interesting and important points here. Can they elaborate on this statement, giving examples of how cultures and available networks may impact acceptability of support from social networks?**

In response to this comment an reviewer 3's feedback we have expanded on the introduction to elaborate on the points made which will hopefully reassure reviewers 2&3.

*Social networks can provide a range of supports to an individual with a health condition but such support is contingent on the availability of requisite knowledge, understanding and willingness to provide help within networks which is not always present [14]. Whilst cross-cultural social network*

*studies are limited in number, research has demonstrated that network homogeneity and generalized trust within networks varies across cultures [14, 15]. Further, research has demonstrated that propensity to seek help from others amongst older adults was dependent on informal logical and cultural rules which affected their decisions to help-seek, where to go in order to obtain support, whether it was available and adequate and interpretations of others willingness to provide help [16].*

**Methods**

**PPI appears to be a key strength in conducting this review, however this is not discussed in the context of conducting the review. It would be helpful if the authors could provide a description of how PPI shaped and informed the design of the review. For example, any key suggestions on aspects to be considered during the review and social network interventions that may otherwise be missed without PPI.**

We have now included additional detail on how PPI strengthened and shaped the design and undertaking of the review in the discussion:

*Our research team included a range of health services researchers, practitioners and five patient and involvement (PPI) contributors. This enhanced the quality of the review in terms of the development of search terms and classification of interventions and resultant interpretation and presentation of findings. Specifically, PPI contributors suggested the inclusion of extracting information relating the PPI in included studies which illuminated the dearth of such activities, provided additional search terms not originally considered, enabled the context of interventions to be understood in more depth to support classification and supported the development of recommendations for future research and practice.*

**Discussion**
**p. 14 "Older age and being male were negatively associated with enhanced social networks at follow-up periods". Can the authors provide potential explanations from the wider literature for this observation?**

We now expanded this section in the discussion to include potential explanations for these associations drawing on the wider literature to support the interpretations.

*Older age and being male were negatively associated with enhanced social networks at follow-up periods [36]. This may reflect the findings in the wider literature which whilst not universal indicate that older people and men tend to have smaller social networks of poorer quality more generally and face more challenges developing and sustaining social networks [42, 43].*

**p.14 It is touched on that future research is required to provide an in-depth understanding of the mechanisms underpinning the impacts of social network interventions and that more sensitive measures of social networks are needed. Can the authors expand on these topics more specifically, perhaps with an example for what might be recommended?**

We have now expanded on the recommendation for future research as suggested by reviewer 2:

*More research is required to provide an in-depth understanding of the mechanisms underpinning such impacts [44]. For example, the extent to which specific properties of networks such as homophily (being together with similar others), weak tie contact or the opportunity for reciprocity might be candidate elements to include in future network interventions. One option is to undertake mixed method systematic reviews to synthesise qualitative data which could be explored in relation*

*to the available quantitative data on outcomes in order to identify potential mechanisms or determinants of behaviour change. This would allow hypotheses to be generated for future testing and would inform logic models for social network interventions to allow for theorizing to be initiated in terms of what works best for whom in what circumstances [45, 46]. Existing measures of social network size and quality may also not reflect more subtle changes in network enhancement (availability of acceptable support or collective efficacy within networks) which indicates the need for more sensitive measures of social networks. The development of a Patient Reported Outcome Measure might allow for the quantification of social network structural and functional aspects by incorporating the perspectives of service user and carers themselves [47].*

**Reviewer #3:**
**In this manuscript a narrative synthesis of research on the effectiveness of social network interventions for persons with mental illness is presented.**
**Overall the manuscript lacks a reasonable theoretical framework reflecting the state of knowledge about the role of social relationships and social networks in the etiology and course of mental illness. Although the authors mention a Network Episode Model they do not further explain how this model could improve our understanding of the associations between characteristics of social relationships and mental state.**

We have now included more detail about the network episode model to explicate the relationships between social relationship and the management of mental health conditions which we hope addresses reviewer 3's concerns. These additions can be found on pages 3-5.

**The following statement that the impact of social networks on mental health problems depends on existing cultures available networks and individual resources is rather cursory and provides no basis for the development of hypotheses about the potential effects of intervention programs.**
**In the following the authors consider several aspects of social networks and social integration but they jump from topic to topic without a discernible thread. Due to this lack of theoretical foundation and argumentative rigor it becomes not clear what purpose social network intervention for people with mental illness should have and what outcomes we can expect from such interventions regarding the improvement of the participants' mental health condition.**

In line with the comments from reviewer 2, we have extended this paragraph (page 4, paragraphs 2&3) to provide examples of the role of culture and available resources which we hope will satisfy this point whilst remaining cognisant of the word count restrictions of the journal.

**In the method section the authors describe a very broad target population "with no restrictions placed on the diagnosis, severity or length and stage of illness" without considering the question whether all people in this target group have the same needs regarding the quality and quantity of their social networks. Moreover, the authors focus on studies the improvement of quality of quantity of social networks as primary or secondary outcome criteria without considering the question how these outcomes are expected to affect the patients' mental health condition.**
**In the results section the authors make good efforts to characterize the selected studies in very detail. This gives the reader a good overview over research activities in this field. However, the study synopsis presented in table 2 also shows the large variety of target groups, intervention measures and outcomes which makes it rather difficult to draw consistent general conclusions from this research.**

Social network interventions represent a promising avenue for mental health services and this manuscript aimed to undertake a foundational review in a first attempt to bring together existing and disparate evidence in this area. Reviewers 1 & 2 recognised the value of such a review despite

the heterogeneity in order to provide a foundational basis for future social network research in the mental health field and to inform future interventions in this regard. Reviewers 1 & 2 also commented on the critical and thoughtful narrative synthesis that was undertaken.

Systematic reviews can be used to usefully map existing evidence bases and identify potentially important evidence gaps and limitations as well as draw definitive healthcare recommendations and conclusions. In order to further reassure reviewer 3, we have ensured we recognise and discuss the limitations that this clinical heterogeneity brought to the review in the discussion section. We note that reviews of a similar scope have recently been published in Social Psychiatry and Psychiatric Epidemiology and believe this to be a worthwhile enterprise:

https://link.springer.com/article/10.1007/s00127-019-01739-1
https://link.springer.com/article/10.1007/s00127-018-1578-y
https://link.springer.com/article/10.1007/s00127-018-1519-9

**In the discussion the authors touch several important points, including the question of the translation of effects on the characteristics of social networks to mental health outcomes. Nevertheless, I am also missing a more in depth discussion of the social, psychological and even biological working mechanisms assumed to underlie the intervention approaches. I am not generally denying the value of such narrative reviews but with regard to the complex nature of social relationships I would expect more theoretical depth and conceptual clarity already at the stage of the literature search. This would enable the authors to consider the theoretical basis and the contents of the interventions of the included evaluation studies more critically with regard to plausibility of the intended outcomes. In turn this would enable the authors and the reader of the review to understand the possible reasons for the success or the failure of many interventions a little better. Finally this would improve of our understanding of the nature and the dynamics of social relationships under the particular conditions of mental illness and the potential ways to empower people with mental illness to develop the necessary skills to shape their social relationships according to their needs and wishes.**

We have expanded both the introduction section to include more detailed consideration of the mechanisms that may underpin the relationships between social network support and mental health condition management. We have provided more detail on the underlying theoretical approach, the Network Episode model, to provide additional theoretical depth and conceptual clarity. We have included recommendations for future research which include the examination of mechanisms of impact which was not the focus of the current review.

I hope these revisions meet with your approval and I would like to thank the reviewers for their helpful contributions to the article. Should you have any further queries, please do not hesitate to contact me.

Yours sincerely.

Helen Brooks
Senior Lecturer in Mental Health

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# Assessing the effectiveness of social network interventions for adults with a diagnosis of mental health problems: a systematic review and narrative synthesis of impact.

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**Abstract**

**Background:** Social connections have been linked to the genesis and amelioration of mental health problems and thus have potential therapeutic value.

**Purpose:** To identify the current evidence base, assess risk of bias and synthesise findings on the effectiveness of social network interventions for people with mental health problems.

**Methods:** Electronic databases (MEDLINE, Embase, PsycINFO, CINAHL, Cochrane Library, Web of Science, Scopus) and grey literature databases were systematically searched from inception to August 2020 using free text syntax combining synonyms for 'mental health problems' and 'social network interventions'. Articles were eligible for inclusion if they reported data from randomised controlled trials on the effectiveness of interventions designed to improve social networks for adults (18+) with mental health problems. Papers were independently reviewed for inclusion with conflicts resolved through consensus. Included papers were quality assessed and data extracted and synthesised narratively. Risk of bias was assessed using the Cochrane Risk of Bias Tool.

**Results:** Nine studies randomising 2226 participants were included. Four focused on those with a diagnosis of schizophrenia or psychosis, one on major depressive disorder and four included all types of mental health diagnoses. The current evidence base is of unclear quality. However, interventions which focused on supporting social activities appear to hold the most promise for enhancing social networks. Data on cost effectiveness and research acceptability were limited but suggest the potential economic feasibility of and acceptability for evaluating these interventions.

**Conclusion:** There is emerging evidence that social network interventions can be effective in improving social connections for people with mental health problems. However, further evaluations with robust methodological approaches are required to inform evidence-based recommendation for health services.

**Key words:** Mental health, social networks, systematic review, narrative synthesis,

## Introduction

Mental health problems commonly occur with estimated lifetime prevalence rates of between 18 and 36% [1]. There are more disability adjusted life years lost per year to mental health problems than any other health condition in the UK and costs to the individual, society and the economy are considerable [2]. Adults with severe mental health problems[1], such as schizophrenia and bipolar disorder, experience higher rates of multiple and more complex physical comorbidities resulting in significantly reduced life expectancy of approximately 15-20 years [4]. It is therefore imperative that health services are able to effectively and appropriately offer a range of support to people with mental health problems.

Social networks refer to the structure and function of a person's social relationships and the nature of the ties that connect them [5]. A person's social network constitutes the set of connections which have the capacity to link people to relationships and resources and can aid, restrict and reshape the way in which mental health problems are managed [6]. These connections can take a variety of configurations covering the broad range of people, non-human agents, places, things and activities which may be involved in the everyday management of mental health problems [6, 7]. Increased connectivity is linked to the provision of social support, interpersonal contact and the mobilisation of resources [8] which acts to buffer stress through the provision of functional support as well as enhancing individual coping strategies [9]. However, this differs across groups and contexts [10, 11]. For example, high contact with social networks can increase levels of depressive symptoms for women if they are accompanied by a burden of obligation to provide large amounts of social support to others [9].

The Network Episode Model (NEM) provides a theoretical basis for understanding the contributions social networks make to the daily management of mental health problems [12, 13]. The NEM rejects individualistic approaches to mental health self-management and conceptualizes self-management instead as a collective activity that people do in conjunction with their social network [12, 13]. In line with other social network approaches, the NEM provides an analytic focus on the activation of social network ties in response to mental health problems and captures the

[1] Defined as mental health problems which substantially interferes with or limits functional or occupational activities
3. Public Health England, *Severe mental illness (SMI) and physical health inequalities: briefing*. 2018, Public Health England: London.

dynamic social processes through which an individual manages their mental health problems with formal (mental health professionals) and informal (friends and family ) networks [12, 14].

An individual's ability to obtain support from their social networks and negotiate its acceptability to themselves and other members of their network is impacted by existing cultures and available network and individual resources [13, 15]. Social networks can provide a range of supports to an individual with a health condition but such support is contingent on the availability of requisite knowledge, understanding and willingness to provide help within networks which is not always present or available to individuals [16]. Whilst cross-cultural social network studies are limited in number, research has demonstrated that network homogeneity and generalized trust within networks varies across cultures [17, 18]. Further, research has demonstrated that propensity to seek help from others amongst older adults was dependent on informal logical and cultural rules which affected their decisions to help-seek, where to go in order to obtain support, whether it was available and adequate and interpretations of others willingness to provide help [19].

Diverse and supportive social networks have been found to have a positive influence on recovery for people with a diagnosis of severe mental illness [20]. However, people with mental health problems also tend to have smaller networks of poorer quality and configuration [21]. There is also evidence too of variability in the availability of network resources over time, illness phases, illness severity and setting [22]. A mental health diagnosis has been shown to lead to an erosion of existing high quality network connections in terms of size, diversity and access to resources [14]. However, network disruption can result in network reconfiguration with new network members replacing weak, lost or absent ties which may be more protective against psychological distress and of greater utility in managing a long-term condition. [23]. The latter points to markers for the development and implementation of interventions aimed to improve mechanisms for mental health management and recovery.

Improving network based strategies for managing everyday mental health and promoting social integration are necessary for accessing community-based support and promoting and engagement in meaningful activity [24]. In

turn, social activity can lead to increased social network size and access to social capital[2] creating a virtuous circle [6]. Social networks can also mediate the effects of social isolation and loneliness and enhance self-management [20, 26]. Thus, social network interventions which assist with eliciting preferences for connecting to meaningful, valued activities in domestic and local environments extends the availability of heterogenous support for the secondary prevention of mental health problems. [7, 27]. Whilst such interventions are successful for long-term physical health conditions (e.g. social prescribing), they have been slow to translate into mainstream mental healthcare despite the relevance of community engagement and integration for recovery [7].

This review aimed to provide a critical overview of the evidence base underpinning interventions designed to improve the quantity and quality of social networks of people with mental health problems. The acceptability, feasibility and cost effectiveness of evaluating these social network interventions was explored by examining available data on evaluation adherence, attrition and cost evaluations within included trials.

***Review questions:***

What is the effectiveness of interventions designed to improve the quantity and quality of social networks of adults with mental health problems?

What are the factors that influence the effectiveness of social network interventions for people with mental health problems?

**Methods**

The methods and reporting of this systematic review and narrative synthesis follow PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidance [28]. The protocol for the review is available from: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020206490

[2] Defined as "Features of social organisation, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions" 25. Putnam RD., R. Leonardi, and R. Nanenetti, *Making democracy work: civic traditions in modern Italy.* 1993, Princeton: Princeton University Press.

### *Eligibility criteria*

Only published research articles containing primary data were included in the review. Literature or systematic reviews on related topics were excluded but reference lists examined for potentially relevant studies. Studies which recruited adult participants (aged 18+) with any form of self-report or professionally diagnosed mental health difficulty (excluding organic mental health difficulties such as dementia, learning disability and co-morbidities such as substance abuse) were considered, with no restrictions placed on the diagnosis, severity or length and stage of illness. In mixed samples, mean age requirement was a minimum of 18 years and 75% of identified samples required a primary diagnosis of mental health difficulties or self-reported emotional distress.

Eligible studies had to report on an intervention designed specifically to increase the quantity or quality of social networks. In the context of this review social networks were defined as personal communities - the constellation of relevant relationships, activities and resources that are identified as important by an individual [29]. Eligible studies also had to include a measure of social network quantity or quality as either a primary or secondary outcome and utilise a randomised design with a comparison group. There were no restrictions placed on eligible studies based on language or date of publication. Non-English language articles were screened for eligibility by native speakers affiliated with the research team. See Table 1 for inclusion and exclusion criteria.

### *Search strategy*

Seven electronic databases were searched (MEDLINE, Embase, PsycINFO, CINAHL, Cochrane Library, Web of Science, Scopus) were searched on the 29th of August 2020 from the earliest record and updated on the 5th October 2021. The search strategy was organised using the first two components of the PICO framework and was purposively broad in order to optimise retrieval (See Appendix 1 for example search):

***Population:*** People with a diagnosis of mental illness or self-reported emotional distress

***Intervention:*** Social network

The search strategy was informed by published reviews, extant literature on social network interventions and following discussions with the wider authorship team. A draft version of the strategy was also subject to a PRESS review by an expert librarian [30].

In order to minimise the impact of publication bias, grey literature sites were searched including OpenGrey and EThoS. We contacted authors of identified conference abstracts for full manuscripts. Where these were not readily available through web search strategies, reference lists of included manuscripts were also scrutinized for relevant studies. Additionally, we examined identified book chapters and literature reviews for relevant literature. Key journals were hand searched: Social Psychiatry and Psychiatric Epidemiology, BMC health services research, Journal of Mental Health, British Journal of Psychiatry and Lancet Psychiatry

***Data selection and extraction***

Search results were uploaded to the data management software Covidence (http://www.covidence.org) and duplicates removed. Titles and abstracts were double screened with conflicts resolved by a third reviewer. Eligibility assessments of full texts of potentially eligible manuscripts were undertaken by two reviewers with conflicts resolved by consensus. A systematic data extraction tool was developed using Excel into which quantitative data relating to the outcomes of interventions were extracted, along with data relating to study design, participants, adherence/attrition, cost effectiveness and other relevant contextual factors. 30% of extractions and quality appraisals were checked for accuracy.

***Analysis***

A meta-analysis of included studies including pooling the data and comparing mean differences of related outcomes (e.g. network size) was originally planned but given the heterogeneity of included studies this was not possible and a narrative synthesis was undertaken. This followed the stages outlined in the Guidance on the Conduct of Narrative Synthesis in Systematic Reviews [31].

An initial synthesis was undertaken by producing textual summaries of study characteristics (e.g. design, participants, intervention, recruitment) in data extraction spreadsheets. Included studies were organised alphabetically in excel sheets but allocated a colour code by type of intervention. We used 'vote counting' to describe the number of studies which demonstrated positive, negative or neutral results relating to social network outcomes [31]. The next stage of the narrative synthesis involved a consideration of the factors that influenced successful outcomes and any other included outcome measures. Prior to finalising the synthesis all included studies were revisited along with the PRISMA checklist (Appendix 2) to ensure relevant data was not omitted from the presentation of results.

## Results

The results of the search, screening and selection for final included studies can be found in Figure 1. Initial searches generated 18,599 hits of which 2279 duplicates were removed. The majority of the remaining 16320 were excluded at title and abstract screening. Of the 787 full texts screened for eligibility, 9 were included in the systematic review. The main reasons for exclusion were interventions not being designed with an explicit focus to improve social networks, non-mental health populations and non-RCT designs (Figure 1).

### *Description of included studies*

The studies reported were heterogenous in terms of intervention format and delivery, outcome measures and length of follow-up. Descriptions of included studies can be found in Supplementary File 1.

#### *Study characteristics*

Three studies were carried out in the USA [32-34], two in the UK [35, 36] and one each in Denmark [37], Italy [38], Ireland [39], and the Netherlands [40]. All studies reported on the results of interventions for formal mental health diagnoses and no studies included those with self-reported emotional distress. Four studies included only those with

a diagnosis of schizophrenia or psychosis [35, 37, 38, 40] with one recruiting only those with first episode psychosis [37]. One study exclusively comprised people with major depressive disorder [33] and the remaining studies included people with broader diagnostic categories of mental illness described as enduring mental health problems [39], AXIS I and II disorders (using DSM-III-R), [34], AXIS I Psychotic or mood disorders (DSM version not reported) [32] or included all forms of mental health conditions [36]. Most studies utilised broad conceptualisations of social networks incorporating both quantity and quality of social network support [32-36, 38-40]. Only one used social network size as the sole proxy for social network contributions with the authors acknowledging this as a limitation [37].

*Participant characteristics*

Included studies randomised a total of 2,226 participants across intervention and control conditions. The average age of included participants was 35.7 years. On average 49.4% of participants were female. Only 5 reported ethnicity data with White participants accounting for 47% of participants across these included studies. Black participants accounted for 34.4%, Hispanic participants for 6.2%, Asian participants for 1% and other ethnicity groups accounting for 11.4%.

*Intervention characteristics*

Included studies recruited from formal health services (community and inpatient settings) and all interventions were delivered in the community. Five were delivered/facilitated by health professionals [33-35, 37, 40], three by lay volunteers including peers or family members [32, 36, 38] and one by a combination of professional and lay facilitators [38]. Allocated control conditions were mostly treatment as usual [32-35, 37, 38] or wait list control [40]. Active comparators included financial stipend [39], personal recovery workbook [36].

Intervention duration ranged from 3-12 months with follow-up data collection periods ranging from 3-24 months. All interventions were delivered face-to-face. Interventions mostly comprised supported social activity/community; one explicitly aimed to develop a friendship between participant and facilitator [39]; and one included financially

supported socialisation [39]. One intervention was a closed peer support group with a primary aim of improving participants' social networks [40]. Two interventions involved one-to-one work with participants using either cognitive behavioural therapy [33] or recovery-focused activities aiming to enhance social networks [36]. Three interventions were assertive community treatment interventions with a social network focus which included family members and friends in the treatment process [34, 35, 37].

***Risk of bias***

Details of the risk of bias assessments drawing on the Cochrane Risk of Bias Tool [41] are presented in Supplementary File 1 which incorporated six domains where bias could be introduced into trial design. No studies were assessed as being "low risk of bias". Five studies were assessed as being high risk and the other four did not provide sufficient information for risk of bias assessments to be undertaken. Therefore the proportion of information from studies at high risk of bias is considered sufficient to affect the interpretation of results [41].

***Clinical effectiveness***

Summary information on clinical effectiveness, effect size and study quality can be found in Table 2. Interventions were categorised into four types based on core activities: supported social activity, peer support, assertive community treatment and one-to-one interventions.

*Social network quality and quantity*

Structured support for undertaking social activity

All three interventions in this category provided some evidence of the potential impact of structured support for socialising in terms of improving the quantity and quality of social networks [32, 38, 39]. The two interventions which had a usual care comparator demonstrated significant improvements in social networks at 12-month (Effect size 0.47) [32] and 24-month follow-up (OR: 1.8) - [38]) in the intervention groups. The third which compared supported socialisation with a financial stipend to the provision of finical stipend only demonstrated significant

improvement in both groups which favoured the intervention but did not reach significance. All three interventions targeted severe and enduring mental health problems such as psychosis and schizophrenia.

Terzian and colleagues targeted people under 45 years. Those with poor social networks (defined as five relationships) demonstrated a significant social network improvement (defined as an increase in number, frequency, importance, or closeness of relationships) at both one-year (OR 1.8, 95% CI 1.2 to 2.8) and two-year follow-up (OR 1.8, 95% CI 1.2 to 2.9) for the supported socialisation intervention which was delivered by professionals and lay facilitators (friends/family) [38]. The intervention was most effective for people who also demonstrated improvement in clinical, work or daily activity outcomes. For those who had no such improvement in these outcomes, the authors reported no impact of the intervention on social networks. The study reported that participants attached greater value to more distal ties than close friendships or confiding relationships [38].

Sheridan et al., [39] compared the effectiveness of a monthly stipend to support weekly leisure/social activity vs. monthly stipend plus supported social activity and friendship activities facilitated by people with no connection to mental health services. There were no significant differences between groups on social network outcomes measures. However, there was a reduction in the number of people who had the most vulnerable types of networks post-intervention and increases in the weekly number of social contacts with friends in both groups [39]. Over the 10-month follow-up period, both groups demonstrated significant increases in social activities (e.g. going to the cinema, enjoying a conversation which favored the partnered group but did not reach statistical significance), and increased social functioning, and decreased social loneliness [39].

Finally Rivera et al., (2007) examined the outcomes of consumer-assisted case management, non-consumer-assisted case management and standard clinic-based care. Consumer-assisted case management involved matching service users with peers on socio-demographics and mental health experience to provide supported socialisation. The study found a significant increase (medium effect size: 0.47) in the number of contacts from baseline to 12-month follow-up in consumer-assisted case management [32]. This effect was suggested to be due to increased contact with peer volunteers and professional staff, rather than with family/friends outside of health services. However, there were

significant improvements in all conditions for other network variables including network density, numbers of people who helped the participant, and number of people who were helped by the participant.

Peer support

Castelein et al., 2008 evaluated the effectiveness of a closed peer support group. This study demonstrated a significant improvement (small effect size: 0.4) in terms of contacts with peer facilitators outside of intervention activities and on 'esteem support' (e.g. asking for help, support and advice, receiving complements). However, esteem support did not extend to the number of other kin/non-kin relationships or to other measures of network quality or satisfaction with network support [40]. People who experienced greater distress from positive symptoms and a longer duration of illness were more likely to report improved social networks at follow-up, in contrast to those with higher distress from negative symptoms who were significantly less likely to improve their social networks [40].

Assertive community treatment

The three assertive community treatment interventions (Calsyn et al., 1998; Tempier et al. 2012; Thorup et al., 2006), demonstrated impact in terms of increasing the number of professionals in networks [34] and the number of significant others at 18-month follow-up (medium effect size: 0..6) [35]. Increases in the size of lay/informal networks were identified as a trend in other studies but did not reach statistical significance [34]. Other studies reported no differences between control and intervention groups at follow-up in relation to social network quantity, quality or the amount of social support received [34, 37]. Increased social network size at follow-up was closely related to younger age, being female, having completed A-levels, less negative symptoms, larger network size at entry [37].

One-to-one interventions

The two one-to-one interventions demonstrated no significant impact on social networks [33, 36] though one reported medium (0.7) effect sizes for increases in social support for those in the intervention group suggesting some improvement to social network quality outcomes [33].

*Other outcome measures*

Interventions demonstrating impact in terms of improving the quantity or quality of social networks either did not report other health-related outcome measures [34] or did not demonstrate significant intervention superiority [32, 38, 39]. However, both groups (stipend and stipend plus peer supported socialisation) in the trial by Sheridan et al. reported a significant reduction in depression symptomatology over the 10-month follow-up period ($p = .001$) [39]. Other included interventions demonstrated significant impact in terms of symptomatology [33, 35, 40], psychological distress [33], self-esteem [33], functioning [35], readmission to mental health services [36] and satisfaction with care [36]. Medium reported effect sizes ranged from 0.5 to 0.7 demonstrating the direct impact of interventions aiming to improve network engagement may be independent from observable changes in social networks.

***Economic evaluation***

Only two studies reported data pertaining to the evaluation of the costs associated with the interventions [38, 40] with only one of these constituting a formal cost assessment [40]. Castelein and colleagues [40] registered all prospective healthcare costs for included participants and other costs associated with the intervention. Their mixed model analysis demonstrated no significant differences in the mean total costs for both the intervention and control group. Terzian included an economic assessment and concluded their intervention had the potential to be readily included in routine care without the need for supplementary resources [38].

***Research feasibility and acceptability of evaluating social network interventions***

Of the 2,226 participants randomised, 586 (26%) dropped out of the research follow-up and 1640 completed data collection at all time points. The lowest drop-out rates were identified in the supported socialisation intervention delivered by health professionals and natural facilitators [38] and the closed peer support intervention [40]. The highest withdrawal rates were found in the one-to-one recovery-focused intervention [36] and the supported socialisation with friendship intervention [40]. For the one-to-one recovery-focused intervention, the 18-month follow-up response rate was considered a limitation but reasons for withdrawal were not discussed [36]. For the supported socialisation intervention, reasons for the high level of withdrawal which were concentrated in the intervention group included the emotional and practical demands of establishing and sustaining new friendships initiated during the intervention [39].

Most studies reported that participants and facilitators viewed the intervention positively with adherence not explained by demographic or clinical characteristics [34, 36, 40]. Data from associated process evaluations were lacking.

***Patient and public involvement***

No included studies provided detail on any formal patient and public involvement in either the design and delivery of the intervention or the randomised controlled trial. One study reported that an intervention was adapted following feedback from participants [33].

**Discussion**

We undertook a narrative synthesis of empirical data from randomised controlled trials to systematically examine whether social network interventions are effective in enhancing the quantity and quality of social networks for people with mental health problems. Despite the small number and inadequacies of the included studies, our analysis points to most promise of interventions which provide support for social activities supporting the findings of previous research [42, 43]. However, most studies (7/9) lacked requisite information to undertake assessments of potential bias on at least one quality domain. Information on adherence to the candidate interventions was lacking in

7/9 studies and detail on blinding of outcome assessors was omitted in 4/9 studies or assessed as high risk in another. Future research would benefit from more detailed descriptions of methods in order for quality assessments to be fully undertaken and to allow definitive conclusions about optimal treatments to be derived.

For interventions which were effective in enhancing social networks, effect sizes were generally small to moderate when compared to usual care. These benefits did not routinely translate to improvements in mental health outcomes, suggesting more research is needed to investigate whether there is an embedding period beyond the follow-up periods in included studies [32, 38, 39]. Other studies which were not effective in improving social networks did provide evidence of demonstrable impact in a range of other outcomes (in particular assertive community outreach and one-to-one treatment) suggesting a more direct mode of action but one that might not be sustainable post-treatment without associated network improvements [33, 35, 36, 40]. More research is required to provide an in-depth understanding of the mechanisms underpinning such impacts [44]. For example, the extent to which specific properties of networks such as homophily (being together with similar others), weak tie contact or the opportunity for reciprocity might be candidate elements to include in future network interventions. One option is to undertake mixed method systematic reviews to synthesise qualitative data which could be explored in relation to the available quantitative data on outcomes in order to identify potential mechanisms or determinants of behaviour change. This would allow hypotheses to be generated for future testing and would inform logic models for social network interventions to allow for theorizing to be initiated in terms of what works best for whom in what circumstances [45, 46]. Existing measures of social network size and quality may also not reflect more subtle changes in network enhancement (availability of acceptable support or collective efficacy within networks) which indicates the need for more sensitive measures of social networks. The development of a Patient Reported Outcome Measure might allow for the quantification of social network structural and functional aspects by incorporating the perspectives of service user and carers themselves [47].

Only a small number of included studies highlighted factors associated with the effectiveness of social network interventions. However, there was emerging evidence of the potential influence of a number of factors. For example, people with better clinical prognoses experienced greater improvements to their social networks [38] as did people with better quality networks at baseline [37]. Older age and being male were negatively associated with enhanced

social networks at follow-up periods [37]. This may reflect the findings in the wider literature which indicates that older people and men tend to have smaller social networks of poorer quality more generally and are more likely to face more challenges developing and sustaining social networks over time [48, 49]. Negative symptoms was associated with poorer quality of networks at follow-up [37, 40] whereas distress from positive symptoms was associated with enhanced social networks at follow-up [37]. Future research is required to examine mediating factors to guide future implementation [46].

Most interventions limited the types of network members included within networks to friends and family members and failed to incorporate alternative forms of network members identified as important to mental health management in the wider literature, including weak ties [7, 50], valued places, objects and activities [6, 7] and companion animals [51, 52]. This broader view of social network support was supported by the value attached to distal relationships by participants. Furthermore, complexities associated with establishing and maintaining friendships leading to withdrawal, and the equivalence in social networks of those involving financial stipend +/- peer support [39], lends further support to the value of alternative network members [7].

Despite a number of included studies reporting that the research processes were well received by participants and facilitators which suggests a willingness to participate in such evaluations [34, 36, 40], in-depth data on the feasibility of evaluating social network interventions was not reported and studies had an average drop-out rate in excess of 26%. There was also limited data in included manuscripts about intervention acceptability. The Medical Research Council's guidance for the evaluation of complex intervention recommends the undertaking of process evaluation in order to understand the mechanisms through which interventions work and future evaluation should incorporate these in the design of evaluative studies [45]. Future research should also consider the minimum intervention period required, potential for intervention latitude - the freedom to undertake local adaptation which is critical for maximising intervention effect, ownerships and for promoting sustainability [53] - and consider the reasons for participant withdrawal and how to mitigate against these in order to inform intervention development and implementation.

Peer support in the design and delivery of mental health services has been shown to reduce hospital admissions and drive recovery-focused care, a core value enshrined in global health policy [54]. However, evidence in terms of using peer supported socialisation outside formal mental health services; however, is mixed [55]. This review contributes to this debate by demonstrating that professional facilitators appear best placed to bring about increases in professional support within networks and peer workers are effective in developing relationships with service users that endure outside of health services [32, 40]. The review also supports other studies which have shown that, in order to make changes to whole networks and improve socialisation in the wider community, efforts are best focused outside of mental health services. This includes interventions drawing on lay workers that have no connection to formal service provision [56]. Potential reasons for this evident in the wider literature include expectations of acceptance by peers with similar experiences which were not realised in practice, limited instrumental resources and social networks of peer facilitators and the community stigma associated with mental health problems [56] Future research is required to understand optimal facilitation and what characteristics, training and support plans are required in order to effectively facilitate social network interventions for people with mental health problems [57].

This systematic review draws strength from the rigorous search strategy and extraction methods. In order to mitigate against bias, researchers independently screened all potentially eligible manuscripts with any conflicts resolved through consensus. Our research team included a range of health services researchers, practitioners and five patient and involvement (PPI) contributors. This enhanced the quality of the review in terms of the development of search terms and classification of interventions and resultant interpretation and presentation of findings. Specifically, PPI contributors suggested extracting information relating the PPI in included studies which illuminated the dearth of such activities, provided additional search terms not originally considered, enabled the context of interventions to be understood in more depth to support classification and supported the development of recommendations for future research and practice. Analysis was hindered by the clinical and methodological heterogeneity of included studies and a lack of shared definitions and theoretical underpinnings of the term 'social network' and related concepts within manuscripts. The majority of included studies focused on schizophrenia or other forms of psychosis and generalisability to other mental health problems is unclear. There was a lack of economic data in included studies which meant a full analysis in this regard was not possible. Despite employing no country or language restrictions,

all identified studies were limited to the USA and Europe which is an important limitation given that social networks are embedded in and reflect local cultures and contexts. Further research is required which incorporates wider geographical and cultural diversity.

***Conclusion***

We found preliminary evidence that social network interventions can be effective in improving social networks for people with mental health problems. However, this review demonstrates that evidence for social network interventions for people with mental health problems is in its infancy and further rigorous evaluation is required to inform evidence-based recommendation for health services. Future research should incorporate nested process evaluations in order to understand and optimise implementation, adequate patient and public involvement to increase intervention uptake and acceptability and high-quality cost data to allow in-depth economic modelling to be undertaken.

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**Conflicts of interest/Competing interests**

On behalf of all authors, the corresponding author states that there is no conflict of interest.

**Availability of data and material**

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study. All extracted data is available with the manuscript

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*Table 1: Inclusion and exclusion criteria*

| *Inclusion criteria* | *Exclusion criteria* |
|---|---|
| Published journal articles, or dissertations. | Duplicate |
| Primary data from studies which are designed directly to improve the quantity or quality of social networks (based on whole network approach)<br><br>AND<br><br>Include a measure of social network size and/or quality as primary or secondary outcome. | Not primary data (e.g. opinion pieces, review articles, book chapters). |
| Adults with primary diagnosis of mental health problems or self-attribution/non-medical labelling (e.g. stress or emotional distress).<br><br>In mixed samples, mean age must be 18 or over and 75% of sample must have primary diagnosis of mental illness (self-report of physician defined). | Only available in abstract format. |
| Controlled trials (CT) and randomised controlled trials (RCT) including cluster-randomized trials. | Single case studies. |
| | Studies where primary diagnosis is substance misuse, autism, dementia, ADHD, cognitive impairment or spectrum disorders. |
| | Patients without a primary diagnosis of mental health problems or self-attribution of mental difficulties (self-report or clinician diagnosis). In mixed samples 75% or more must have a primary diagnosis of mental illness or self-attribution of mental difficulties. |
| | Non-adult population: Mean age under 18 |
| | Pharmacological interventions |

| | |
|---|---|
| | Intervention's primary function is not related to improving the quantity and/or quality of social networks (conceptualized as a whole network approach). The following will be excluded:<br>1. Dyadic interventions – couples, individual friendship interventions), family level only.<br>2. Individual level intervention – e.g. intervention which aims to improve individual social skills, social functioning/dysfunctioning, social cognitions, confidence in social interaction, perceptions about social interaction, social interaction intentions. |
| | No measure of social network quantity or quality. |
| | Qualitative studies, feasibility studies or uncontrolled or unrandomised trials. |
| | Not accessible. |

*Table 2: Overview of study quality, clinical significance and effect sizes for social network measures*

| STUDY REF | RISK OF BIAS | INTERVENTION DESCRIPTOR (n) | COMPARATOR DESCRIPTOR (N) | OUTCOME MEASURE | DIFFERENCES BETWEEN GROUPS - EFFECT DIRECTION<br><br>+,-,0 | STANDARDISED EFFECT SIZE (OR FOR DICHOTOMOUS VARIABLES AND EFFECT SIZE FOR CONTINUOUS VARIABLES). LONGEST FOLLOW-UP |
|---|---|---|---|---|---|---|
| Terzian, 2013 | HIGH | Supported social activity (n=173) | Standard care (n=172) | A social network improvement—defined as an increase in number, frequency, importance, or closeness of relationships. | + | OR: 1.8. 95% CI: 1.2–2.9 |
| Sheridan, 2015 | HIGH | Supported social activity, volunteer partner, stipend (n=32) | Stipend only (n=38). | Practitioner Assessment of Network Type<br><br>Social and Emotional Loneliness Scale for Adults | 0<br><br>0 | N/A<br><br>0 |
| Rivera, 2007 | UNCLEAR | Peer supported social activity (n=70) | Standard case management (n=66)<br><br>Usual clinical care (n=67) | Pattison Network Inventory: Total number of social contacts<br><br>Social network size<br><br>Density<br><br>Reciprocity | +<br><br>0<br><br>0<br><br>0 | Compared to usual clinical care: Medium effect size: 0.470497 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Castelein, 2008 | HIGH | Closed peer support group (n=56) | Waiting list control (n=50) | Personal Network Questionnaire (PNQ) | + | Participants had a significant increase in contact with peers outside of the sessions. Not possible to calculate effect size. |
| | | | | The Social Support List (SSL) | + | Participants had a significant increase in esteem support (i.e. asked for advice, received a compliment, asked for help). Small effect size: 0.390877 |
| Thorup, 2006 | HIGH | Assertive community treatment. (n=194) | Standard care (n=153) | Social network size | 0 | N/A |
| Tempier et al. 2012 | UNCLEAR | Assertive community treatment (n=57) | Standard care (n=50) | Social network size | + | Medium effect size: 0.609451 |
| | | | | Functional adequacy of social networks | 0 | N/A |
| Calsyn, 1998 | UNCLEAR | Assertive community treatment and community workers<br><br>(sample sizes not provided for each condition) | Assertive community treatment<br><br>Brokered condition (standard case management) | Network size:<br>Size of professional network | + | No sample size provided. |
| | | | | Size of natural network | 0 | N/A |
| | | | | Receipt of material assistance. | + | No sample size provided. |
| | | | | Emotional, advice, recreational and conflict dimensions | 0 | N/A |
| | | | | Qualitative measures of | 0 | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | social relationships<br>Interviewer rated network support:<br><br>Professional network<br><br>Natural network | <br><br><br><br>+<br><br>0 | <br><br><br><br>No sample size provided.<br><br>N/A |
| Johnson et al., 2018 | HIGH | One-to-one recovery focussed intervention (n=220) | Recovery workshop (n=219) | Social network size<br><br>Los Angeles (UCLA) Loneliness Scale | 0<br><br>0 | N/A<br><br>N/A |
| Ammerman, 2013 | UNCLEAR | One-to-one cognitive behavioural therapy (n = 47) . | Standard home visiting (n=46) | Social Network Index - 3 sub-scales:<br><br>Social network size<br><br>Network diversity<br><br>Embeddedness<br><br>Interpersonal Support Evaluation List | <br><br>0<br><br>0<br><br>0<br><br>+ | <br><br>N/A<br><br>N/A<br><br>N/A<br><br>Medium effect size: 0.65 |

*Table 3: Overview of study quality, clinical significance and effect sizes for mental health outcomes*

| STUDY REF | RISK OF BIAS | INTERVENTION DESCRIPTOR (n) | COMPARATOR DESCRIPTOR (N) | OUTCOME MEASURE | DIFFERENCES BETWEEN GROUPS - EFFECT DIRECTION<br><br>+,-,0 | STANDARDISED EFFECT SIZE (OR FOR DICHOTOMOUS VARIABLES AND EFFECT SIZE FOR CONTINUOUS VARIABLES). LONGEST FOLLOW-UP |
|---|---|---|---|---|---|---|
| Terzian et al., | HIGH | Supported social activity (n=173) | Standard care (n=172) | Brief Psychiatric Rating Scale and Global Assessment of Functioning scores (a reduction of more than 3 points in the BPRS score or an increase of more than 5 in the GAF score were classified as clinical improvement) | 0 | N/A |
| Sheridan, 2015 | HIGH | Supported social activity, volunteer partner, stipend (n=32) | Stipend only (n=38). | Beck's Depression Inventory | 0 | N/A |
| Rivera, 2007 | UNCLEAR | Peer supported social activity (n=70) | Standard case management (n=66)<br><br>Usual clinical care (n=67) | Service use Brief Symptom Inventory | 0 | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| Castelein, 2008 | HIGH | Closed peer support group (n=56) | Waiting list control (n=50) | None included. | N/A | N/A |
| Thorup, 2006 | HIGH | Assertive community treatment. (n=194) | Standard care (n=153) | None included | N/A | N/A |
| Tempier et al. 2012 | UNCLEAR | Assertive community treatment (n=57) | Standard care (n=50) | Positive and Negative Syndrome Scale (PANSS)<br><br>Social functioning was assessed by using the Global Assessment of Functioning (GAF) | +<br><br>+ | Medium effect size: 0.548072<br><br>Medium effect size: 0.567348 |
| Johnson et al., 2018 | HIGH | One-to-one recovery focussed intervention (n=220) | Recovery workshop (n=219) | Readmission to an acute service.<br>Days in acute care<br>Questionnaire on the Process of Recovery<br>Illness Management and Recovery Scale<br>Brief Psychiatric Rating Scale | +<br>0<br>0<br>0<br>0 | OR: 0·66 95% CI 0·43–0·99 |
| Ammerman, 2013 | UNCLEAR | One-to-one cognitive behavioural therapy (n = 47). | Standard home visiting (n=46) | Brief Symptom Inventory | + | Medium effect size: 0.73 |

*Table 4: Overview of study quality, clinical significance and effect sizes for other outcomes*

| STUDY REF | RISK OF BIAS | INTERVENTION DESCRIPTOR (n) | COMPARATOR DESCRIPTOR (N) | OUTCOME MEASURE | DIFFERENCES BETWEEN GROUPS - EFFECT DIRECTION<br><br>+,-,0 | STANDARDISED EFFECT SIZE (OR FOR DICHOTOMOUS VARIABLES AND EFFECT SIZE FOR CONTINUOUS VARIABLES). LONGEST FOLLOW-UP |
|---|---|---|---|---|---|---|
| Terzian et al., | HIGH | Supported social activity (n=173) | Standard care (n=172) | Self-care<br>Activities of daily living<br>Hospitalisations | 0<br><br>0<br><br>0 | N/A<br><br>N/A<br><br>N/A |
| Sheridan, 2015 | HIGH | Supported social activity, volunteer partner, stipend (n=32) | Stipend only (n=38). | Rosenberg's Self-Esteem Scale | 0 | N/A |
| Rivera, 2007 | UNCLEAR | Peer supported social activity (n=70) | Standard case management (n=66)<br><br>Usual clinical care (n=67) | Behavioral Health Care Rating of Satisfaction<br>Lehman Quality of Life Inventory | 0<br><br>0 | N/A<br><br>N/A |
| Castelein, 2008 | HIGH | Closed peer support group (n=56) | Waiting list control (n=50) | Mental Health Confidence Scale (MHCS)<br>Rosenberg's Self-Esteem Scale<br>WHO Quality of Life (WHO QoL) Bref | 0<br><br>0<br><br>0 | N/A<br><br>N/A<br><br>N/A |
| Thorup, 2006 | HIGH | Assertive community treatment. (n=194) | Standard care (n=153) | None reported. | | |
| Tempier et al. 2012 | UNCLEAR | Assertive community treatment (n=57) | Standard care (n=50) | None reported. | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Johnson et al., 2018 | HIGH | One-to-one recovery focussed intervention (n=220) | Recovery workshop (n=219) | Client Satisfaction Questionnaire. | 0 | N/A |
| Ammerman, 2013 | UNCLEAR | One-to-one cognitive behavioural therapy (n = 47). | Standard home visiting (n=46) | Not reported. | | |

# Appendix 1: Searches

## Search History:

| Set | Results | Save History / Create Alert · Open Saved History | Edit Sets | Combine Sets (AND / OR) Combine | Delete Sets Select All · Delete |
|---|---|---|---|---|---|
| # 4 | 5,061 | #3 AND #2 AND #1<br>*Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=All years* | Edit | ☐ | ☐ |
| # 3 | 6,566,668 | TI=(Interven* OR train* OR effect* OR trial OR effic* OR RCT OR evaluat* OR implement* OR impact OR randomi?e OR placebo)<br>*Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=All years* | Edit | ☐ | ☐ |
| # 2 | 132,871 | TS=("social network*" OR "interpersonal support" OR "social activit*" OR "social inclus*" OR "social exclus*" OR "social relation" OR "friend* adj2 tie*" OR "famil* adj2 tie*" OR "kin adj2 tie*" OR "non-kin adj2 tie*" OR "social prescri*" OR "weak tie*" OR "strong tie*" OR "social function" OR "social interact*" OR "social tie*" OR "support network*" OR "community network*" OR egonet OR "social capital" OR "social contact" OR "social participation" OR "personal communit*")<br>*Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=All years* | Edit | ☐ | ☐ |
| # 1 | 2,738,711 | TS=(psych* OR "emotional dis*" OR mood OR trauma* OR axis OR "mental illness" OR psychiatr* OR Schizo* OR Depress* OR Bipolar OR "mental dis*" OR anxiet* OR "mental health" OR OCD OR PTSD OR "personality disorder" OR CMD OR SMI OR obsess* OR compuls* OR "obsessive compulsive disorder" OR "post traumatic stress disorder")<br>*Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=All years* | Edit | ☐ | ☐ |
| | | | | AND / OR Combine | Select All · Delete |

# Appendix 1: Searches

▼ **Search History** (63)

| # ▲ | Searches | Results | Type | Actions | Annotat |
|---|---|---|---|---|---|
| 1 | Psych*.ti,ab. | 1160469 | Advanced | Display Results \| More | |
| 2 | "emotional dis*".ti,ab. | 16920 | Advanced | Display Results \| More | |
| 3 | mood.ti,ab. | 71356 | Advanced | Display Results \| More | |
| 4 | trauma*.ti,ab. | 107525 | Advanced | Display Results \| More | |
| 5 | axis.ti,ab. | 26151 | Advanced | Display Results \| More | |
| 6 | (mental adj illness).ti,ab. | 38227 | Advanced | Display Results \| More | |
| 7 | psychiatr*.ti,ab. | 252241 | Advanced | Display Results \| More | |
| 8 | schizo*.ti,ab. | 125870 | Advanced | Display Results \| More | |
| 9 | depress*.ti,ab. | 303098 | Advanced | Display Results \| More | |
| 10 | bipolar.ti,ab. | 39108 | Advanced | Display Results \| More | |
| 11 | (mental adj dis*).ti,ab. | 57332 | Advanced | Display Results \| More | |
| 12 | anxiet*.ti,ab. | 196310 | Advanced | Display Results \| More | |
| 13 | (mental adj health).ti,ab. | 178982 | Advanced | Display Results \| More | |
| 14 | OCD.ti,ab. | 10783 | Advanced | Display Results \| More | |
| 15 | PTSD.ti,ab. | 32265 | Advanced | Display Results \| More | |
| 16 | (personality adj disorder).ti,ab. | 22351 | Advanced | Display Results \| More | |
| 17 | CMD.ti,ab. | 466 | Advanced | Display Results \| More | |
| 18 | SMI.ti,ab. | 2172 | Advanced | Display Results \| More | |
| 19 | obsess*.ti,ab. | 27054 | Advanced | Display Results \| More | |
| 20 | compul*.ti,ab. | 35053 | Advanced | Display Results \| More | |
| 21 | (obsessive adj compulsive adj disorder).ti,ab. | 14759 | Advanced | Display Results \| More | |
| 22 | (post adj traumatic adj stress adj disorder).ti,ab. | 10024 | Advanced | Display Results \| More | |
| 23 | Mental Health/ | 66428 | Advanced | Display Results \| More | |
| 24 | Mental Disorders/ | 84942 | Advanced | Display Results \| More | |
| 25 | (social adj network).ti,ab. | 12039 | Advanced | Display Results \| More | |
| 26 | "interpersonal support".ti,ab. | 517 | Advanced | Display Results \| More | |
| 27 | "social activit*".ti,ab. | 4897 | Advanced | Display Results \| More | |
| 28 | "social isolation".ti,ab. | 6896 | Advanced | Display Results \| More | |
| 29 | "social inclus*".ti,ab. | 2070 | Advanced | Display Results \| More | |
| 30 | "social exclus*".ti,ab. | 3045 | Advanced | Display Results \| More | |
| 31 | "social relation".ti,ab. | 196 | Advanced | Display Results \| More | |
| 32 | (friend* adj2 tie*).ti,ab. | 290 | Advanced | Display Results \| More | |
| 33 | (famil* adj2 tie*).ti,ab. | 1178 | Advanced | Display Results \| More | |
| 34 | (kin adj2 tie*).ti,ab. | 76 | Advanced | Display Results \| More | |

# Appendix 1: Searches

| | | | | | |
|---|---|---|---|---|---|
| 35 | (non-kin adj2 tie*).ti,ab. | 9 | Advanced | Display Results \| More | |
| 36 | "social prescri*".ti,ab. | 77 | Advanced | Display Results \| More | |
| 37 | "weak tie*".ti,ab. | 445 | Advanced | Display Results \| More | |
| 38 | "strong tie*".ti,ab. | 549 | Advanced | Display Results \| More | |
| 39 | "support network".ti,ab. | 1787 | Advanced | Display Results \| More | |
| 40 | "community network".ti,ab. | 122 | Advanced | Display Results \| More | |
| 41 | Egonet.ti,ab. | 6 | Advanced | Display Results \| More | |
| 42 | "social capital".ti,ab. | 7660 | Advanced | Display Results \| More | |
| 43 | "social contact".ti,ab. | 2142 | Advanced | Display Results \| More | |
| 44 | "social participation".ti,ab. | 2520 | Advanced | Display Results \| More | |
| 45 | "personal communit*".ti,ab. | 111 | Advanced | Display Results \| More | |
| 46 | "social function".ti,ab. | 1679 | Advanced | Display Results \| More | |
| 47 | "social interact*".ti,ab. | 30765 | Advanced | Display Results \| More | |
| 48 | "social tie*".ti,ab. | 1878 | Advanced | Display Results \| More | |
| 49 | interven*.ti. | 72944 | Advanced | Display Results \| More | |
| 50 | train*.ti. | 71410 | Advanced | Display Results \| More | |
| 51 | effect*.ti. | 361075 | Advanced | Display Results \| More | |
| 52 | trial.ti. | 30964 | Advanced | Display Results \| More | |
| 53 | effic*.ti. | 37841 | Advanced | Display Results \| More | |
| 54 | RCT.ti. | 402 | Advanced | Display Results \| More | |
| 55 | Evaluat*.ti. | 84821 | Advanced | Display Results \| More | |
| 56 | Implement*.ti. | 19315 | Advanced | Display Results \| More | |
| 57 | Impact.ti. | 66311 | Advanced | Display Results \| More | |
| 58 | randomi#e*.ti. | 26822 | Advanced | Display Results \| More | |
| 59 | placebo.ti. | 7684 | Advanced | Display Results \| More | |
| 60 | 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 | 678235 | Advanced | Display Results \| More | |
| 61 | 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 | 75075 | Advanced | Display Results \| More | |
| 62 | 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 | 1661054 | Advanced | Display Results \| More | |
| 63 | 60 and 61 and 62 | 3674 | Advanced | Display Results \| More | |

## Appendix 2: PRISMA Checklist.

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| **TITLE** | | | |
| Title | 1 | Identify the report as a systematic review. | Page 1 |
| **ABSTRACT** | | | |
| Abstract | 2 | See the PRISMA 2020 for Abstracts checklist. | Page 2 |
| **INTRODUCTION** | | | |
| Rationale | 3 | Describe the rationale for the review in the context of existing knowledge. | Pages 3-4 |
| Objectives | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | Pages 4-5 |
| **METHODS** | | | |
| Eligibility criteria | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | Table 1 |
| Information sources | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | Page 6 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | Appendix 1 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | Pages 6-7 |
| Data collection process | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | Pages 6-7 |
| Data items | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | Pages 6-7 and Supplementary File 1 |
| | 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | Pages 6-7 and Supplementary File 1 |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | Page 8 and Supplementary File 1 |

## Appendix 2: PRISMA Checklist.

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Effect measures | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | Page 8 and Table 2 |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | Page 7 |
| | 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | N/A |
| | 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | Page 7 |
| | 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. | Page 7 |
| | 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | N/A |
| | 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | N/A |
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | Page 8 |
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | N/A |
| **RESULTS** | | | |
| Study selection | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | Figure 1 |
| | 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. | Pages 5-6 and Table 1 |
| Study characteristics | 17 | Cite each included study and present its characteristics. | Supplementary File 1 |
| Risk of bias in studies | 18 | Present assessments of risk of bias for each included study. | Supplementary File 1 |
| Results of individual studies | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. | Supplementary File 1 and Table 2. |
| | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | Page 8 |

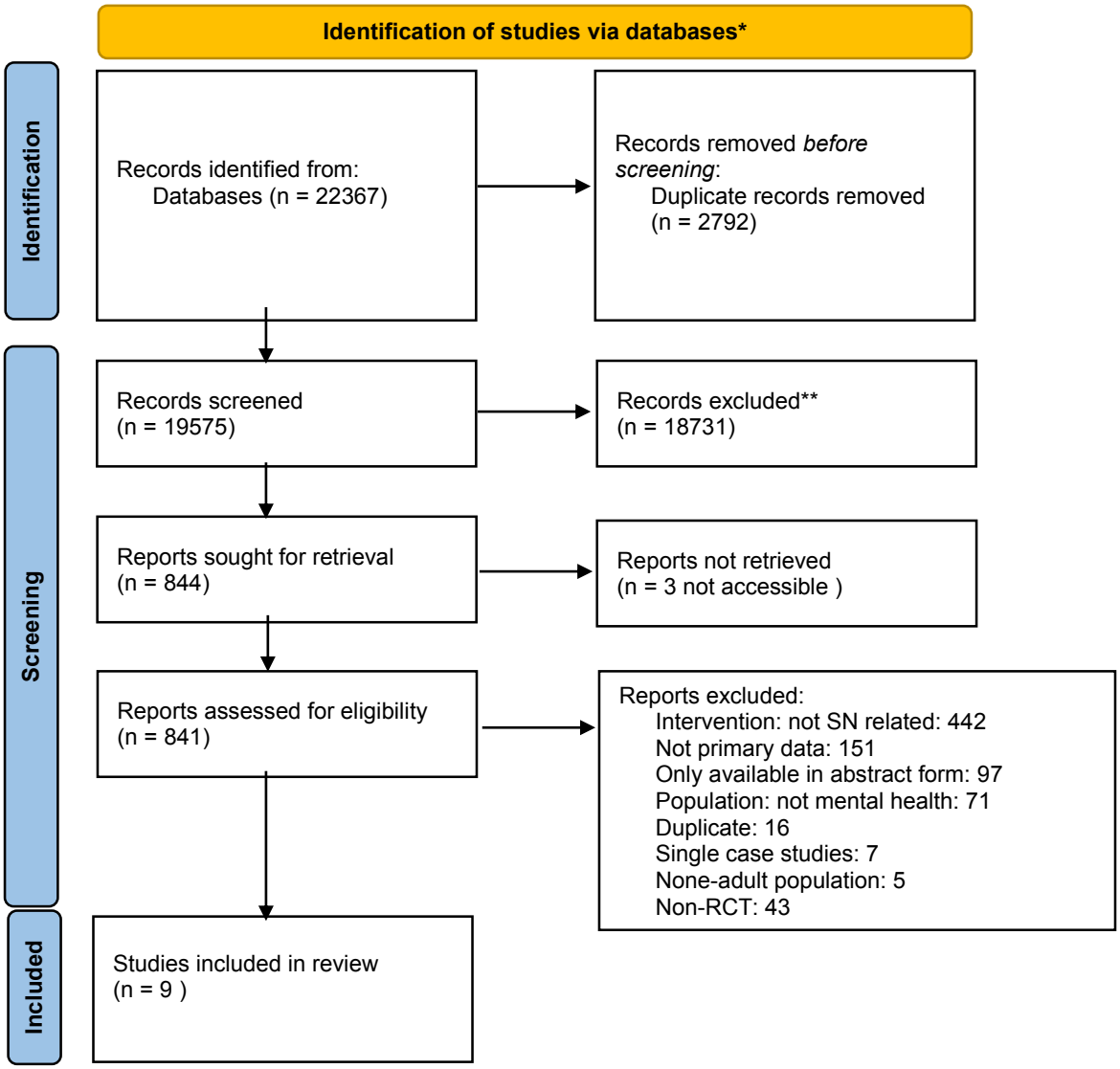
## Appendix 2: PRISMA Checklist.

| Section and Topic | Item # | Checklist item | Location where item is reported |
|---|---|---|---|
| Results of syntheses | 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | N/A |
| | 20c | Present results of all investigations of possible causes of heterogeneity among study results. | N/A |
| | 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | N/A |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | N/A |
| Certainty of evidence | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | N/A |
| **DISCUSSION** | | | |
| Discussion | 23a | Provide a general interpretation of the results in the context of other evidence. | Pages 14-16 |
| | 23b | Discuss any limitations of the evidence included in the review. | Page 16 |
| | 23c | Discuss any limitations of the review processes used. | Page 16 |
| | 23d | Discuss implications of the results for practice, policy, and future research. | Pages 14-16 |
| **OTHER INFORMATION** | | | |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | Page 5 |
| | 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | Page 5 |
| | 24c | Describe and explain any amendments to information provided at registration or in the protocol. | Page 5 |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | Page 17 |
| Competing interests | 26 | Declare any competing interests of review authors. | Page 17 |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. | Page 17 |

*From:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71
For more information

Figure

**Figure 1: PRISMA 2020 flow diagram**



# Supplementary File 1: Data Extraction Table

| Context | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **STUDY ID** (Author last name, year) | **COUNTRY** | **RECRUITMENT METHOD** | **RECRUITMENT SETTING** | **DELIVERY SETTING** | **DATA COLLECTION** | **FUNDING** | **INTERVENTION TYPE AND CONTROL** | **INTERVENTION LENGTH** | **LONGEST FOLLOW-UP PERIOD** |
| Terzian et al 2013 | Italy | Health professional at community mental health service | Community mental health services | Community. | Psychiatrist assessment. | Educational grant of the Consorzio Mario Negri Sud, an independent public–private research institute, which contributed the facilities for data collection and handling, as well as the services for data quality monitoring through its certified unit | Supported social activities.<br><br>Delivered by health professionals or natural volunteers.<br><br>Control: usual care | 3-6 months | 24 months. |
| Sheridan, 2015 | Ireland | Circulation of promotional materials and referral directly from mental health services. | Referral from mental health services and self-referral. | Community. | Structured data collection interviews - quantitative. | Health Research Board grant number, 2006/HRB/RPG06. The funder was not involved in the study design, data gathering, analysis or writing of the final report. | Supported social activities and friendship plus financial stipend. Facilitated by volunteer partner.<br><br>Control: financial stipend only to support social activity. | 9 months. Two hours per week. | 10 months. |
| Thorup, 2006 | Denmark | Referral by health professional | Health services. | Community | Structured interviews and assessments by independent, trained professionals. | The Danish Ministry of Health, the Danish Ministry of Social Affairs, the Danish Medical Research Council, Copenhagen Hospital Corporation, Aarhus County, the Wørzner Foundation and the University of Copenhagen have funded the OPUS-trial. | Assertive community treatment.<br><br>Delivered by health professionals.<br><br>Control: treatment as usual. | 12 months. Took place biweekly in the first 2 months and then once a week in the following 10 months | 24 months. |
| Castelein, 2008 | The Netherlands | Not stated. | Mental Health Care Centres. | Mental Health Care Centrse. | Independent questionnaire completion with a professional available to support. | This study was granted by Zon Mw (the Netherlands Organisation for Health Research and Development), the Rob Giel Research Center, and The Roos Foundation. | Closed peer support group.<br><br>Delivered by: Closed peer support group facilitated by a nurse.<br><br>Control: waiting list | 8 months. 16 sessions of 90 min biweekly over 8 months | 8 months. |

Supplementary File 1: Data Extraction Table

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Calsyn, 1998 | USA | Not stated. | Emergency shelters/health serivces/A&E. | Community. | Interviews by master's level psychologists and social workers. | This project was supported by grants from the National Institute of Mental Health | Assertive community treatment.<br><br>Delivered by health professionals.<br><br>Control: treatment as usual (ACT vs drop in centre vs outpatient setting) | Unspecified. | 18 months. |
| Tempier et al 2012 | England | Not stated. | Early onset trial. | Community. | Questionnaires administered by trained researcher. | None stated. | Assertive community treatment.<br><br>Delivered by health professional.<br><br>Control: treatment as usual | 12 months. | 18 months. |
| Johnson et al 2018 | England | Referral by health professional | Eligible participants had been on crisis resolution team caseloads for at least a week, and had capacity to give informed consent | Community. | Questionnaires delivered by trained researchers. | Undertaken as part of the CORE Study, which was funded by the National Institute for Health Research under its Programme Grants for Applied Research programme (reference RP-PG-0109-10078). | One-to-one recovery focussed work to support community integration and social network enhancement by peer workers.<br><br>Delivered by peer workers.<br><br>Control: personal recovery workbook | Ten individual sessions of 1 hour each with a peer support worker. Sessions took place roughly once per week, aiming to conclude within 4 months. | 18 months. |
| Ammerman (2013) | USA | Referral by health professional | Referral by home visitor. | Home | Standardised outcome measures. | Supported by Grant R34MH073867 from the National Institute of Mental Health | One-to-one cognitive behavioural therapy. with a social network focus.<br><br>Delivered by health professionals | Treatment consisted of 15 sessions that were scheduled weekly and lasted 60 min plus a booster | 3 month follow-up. |

Supplementary File 1: Data Extraction Table

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Control: Treatment as usual. | session one-month post-treatment. | |
| Rivera, 2007 | USA | Recruitment in inpatient units by researchers. | Inpatient units. | Combination of clinic based service provision and that provided in the general community by peer workers. | Assessment of hospital records, monthly interviews using self-report instruments.<br><br>Research assistants who were blind to the treatment assignments collected all interview data, except for the social network measures, which were collected by the professional staff.. | This research was supported by funds furnished by the New York City Department of Health and Mental Hygiene, the New York State Office of Mental Health, and the New York City Health and Hospitals Corporation. This article has not been officially reviewed or cleared by any of the funding sources. | Supported social activity.<br><br>Delivered by volunteer peers<br><br>Control: Treatment as usual. | | 12 months. |

Supplementary File 1: Data Extraction Table

| **Participants** | | | | | | |
|---|---|---|---|---|---|---|
| **STUDY ID (Author last name, year)** | **N RECRUITED** | **AGE RANGE** | **MEAN AGE** | **ETHNICITY** | **GENDER (N or %)** | **PRIMARY DIAGNOSIS** (or MH measure; note if self-report) |
| Terzian et al 2013 | 357 | 18-45 | Not Stated. | Not stated. | CONTROL: 72.1% Male/27.9% Female - INTERVENTION: 65.3% Male/34.7% Female - | Schizophrenia spectrum |
| Sheridan, 2015 | 118 | Not stated. | 51 | Not stated. | 52.3% (n=56) - female | Serious mental illness as denoted by International Classification of Diseases 10 (ICD-10) criteria for schizophrenia, schizophrenia spectrum and delusional disorders (F20-29), mood (affective) disorders (F30-39), neurotic, stress-related and somatoform disorders (F40-40) and mental and behavioural disorders due to psychoactive substance use – drug-induced psychosis (F10-19; ICD-10). |
| Thorup, 2006 | 547 | 18-45 | Not stated. | Not stated. | 40.9% (n=224) female. | ICD-10 diagnoses of schizophrenia, acute psychoses, schizotypal disorder, schizoaffective disorder or other delusional disorders in the F20- spectrum |
| Castelein, 2008 | 106 | Not stated, | CONTROL: 39.4 INTERVENTION: 37.8 | Not stated.. | CONTROL: 63% MALE.INTERVENTION: 68% MALE | Schizophrenia or a related psychotic disorder. |
| Calsyn, 1998 | 165 | None | Study 1: 33.66; Study 2: 34.76 | Study 2: 45% Caucasian; 54.5% African-American | 58% male | **Study 2:** The sample had DSM-IIIR AXIS I diagnoses. |
| Tempier et al 2012 | 144 | 16-40 | 25.85 | White Specialised Care (SC) (n=24) 42% Standard care (ST) (n=12) 24% Black SC (n=24) 42% ST (n=29) 58% Other SC (n=9) 16% ST (n=9) 18% | SC: (n=30) 53% Male. ST (n=39) 78% Male. | First episode of psychosis. |
| Johnson et al 2018 | 441 | Not stated. | 40 | White: Intervention (65%) control (65%) Black (UK, African, Caribbean, and Other) intervention (20%) control (19%) Asian (UK, south Asian, Chinese, and Other) intervention (6%) control (6%) Other intervention (9%) control (11%) | Male intervention 88/220 (40%) control 87/218 (40%) Female intervention 132/220 (60%) control 131/218 (60%) | All diagnoses. |

Supplementary File 1: Data Extraction Table

| | | | | | | |
|---|---|---|---|---|---|---|
| Ammerman (2013) | 93 | 16–37 years. | 21.9 | White: IH-CBT: 30 (63.8%); SHV: 28(60.8%)<br>African American: IH-CBT: 14(29.9%); SHV: 16(34.8%)<br>Native American: IH-CBT: 1(2.1%); SHV: 0 (0.0%)<br>Native Hawaiian or other Pacific Islander: IH-CBT 1(2.1%); SHV: 1(2.2%)<br>Bi-racial: IH-CBT: 1(2.1%); SHV: 1(2.2%)<br>Latina: IH-CBT: 3(6.4%); SHV: 4(8.7%)<br>None: IH-CBT: 44(93.6%); SHV: 42(91.3%) | 100% Female. | Major Depressive Disorder (MDD) |
| Rivera, 2007 | 255 | Not reported. | 38.3 years | **Race or ethnicity**<br>Caucasian: 58 (29%)<br>African American 35 (17%)<br>Hispanic 62 (31%)<br>Other: 48 (24%) | Female: 100 (49%) | All participants had a diagnosis of a psychotic or mood disorder on axis I. |

| **Outcomes** | | | | | |
|---|---|---|---|---|---|
| **STUDY ID:** | **Social network measure** | **Social network measure data** | **Other relevant social network data.** | **Other outcomes** | **Authors conclusion** |
| Terzian et al 2013 | Social network size: Number, frequency, importance, or closeness of relationships | A social network improvement was observed at year 1 in 25% of the patients allocated to routine treatment and in 39.9% of those allocated to the experimental arm (OR 2.0, 95% CI 1.3 to 3.1; adjusted OR 2.4, 95% CI 1.4 to 3.9).<br><br>The difference remained statistically significant at year 2. | Participants attributed higher value to arm's length relationships rather than friendships or confiding relationships.<br><br>Results suggest that improving social networking produces beneficial effects in patients with a better clinical prognosis. E.g. a good clinical prognosis might anticipate a good response in terms of social network improvement. This is not the case for the other outcomes, as the experimental treatment appears to be effective by and large regardless of improvements or worsening of work or activities of daily living. | No significant differences emerged for any of the other end points (Brief Psychiatric Rating Scale/Global Assessment of Functioning/Self-care/Activities of daily living/Hospitalisation/Work). However, patients with 1 or more other areas of improvement at year 1 and 2 showed a statistically significant social network improvement. | The activation of social networks as an activity integrated with standard psychiatric care is practicable, without added economic and organizational costs, and appears to produce an effect persisting well beyond its implementation. |

Supplementary File 1: Data Extraction Table

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| Sheridan, 2015 | Practitioner Assessment of Network Type | At baseline, approximately 54% of the partnered and 57% of the un-partnered group were living in social networks with relatively limited contact with friends or neighbours and approximately 40% of both groups in the two most socially vulnerable networks. The main change over the course of the study was the extent to which participants reported having contact with friends on a weekly basis. However, the proportion of respondents in both groups who had no friends remained reltively unchanged.<br><br>Although there was variability in the extent to which the social networks of the control and intervention groups changed through- out intervention, there was a decline in the proportion of participants in the two most vulnerable networks. | | **Beck depression Inventory:** No significant difference between groups..<br>**Loneliness:** Social and family loneliness decreased significantly over time for both groups. Romantic loneliness scores also decreased, the decrease was not statistically significant.<br>**Rosenberg's self-esteem measure:** Both groups demonstrated good levels of self-esteem and levels remained consistent for both groups throughout the study.<br>**Social functioning:** involvement in social recreational activities increased significantly over time for both groups and there was a slightly higher level of recreational involvement in the partnered group; however, the difference between both groups was not statistically significant. | The intervention showed no statistical differences between the control and intervention groups on primary or secondary outcome measures. The stipend and the stipend plus volunteer partner led to an increase in recreational social functioning; a decrease in levels of social loneliness, in depression and in the proportion living within a vulnerable social network. |
| Thorup, 2006 | Social network size: Number of contacts with family and friends | The type of treatment did not affect the social network size after 2 years of intervention, since the distribution was not significantly different for ST and IT. At 2-year follow-up, IT patients had on average 4.3 contacts with family members in the previous month, while ST patients had on average 4.7 contacts (P = 0.28). The average number of contacts with friends during previous month was 3.8 for both IT and ST patients. | The final models included both age and network size at entry, but while the final model for family-network size included male gender and disorganised dimension, the friends-network size model included negative symptoms and A-level status as the significant variables. The univariate models show that dependence syndrome leads to less family contact, while not having completed high school and poor academic premorbid functioning do not. The geo-graphical variable 'site' only has significant impact on number of friends. | None reported. | Premorbid function- ing, network size at entry and DUP is closely related to small social network size. The integrated psycho- social treatment programme was not sufficient to address this problem. |

Supplementary File 1: Data Extraction Table

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| Castelein, 2008 | Self-developed list [Personal Network Questionnaire (PNQ)] asking for information on the frequency of contacts with named family, friends, and members of the peer support group. | Participants had a significant increase in contact with peers outside of the sessions (P = 0.03) and on esteem support (i.e. asked for advice, received a compliment, asked for help; P = 0.02) in comparison with the WLC condition (56% improvement vs 31% improvement). The positive effect on peer contact did not generalize to other relationships; for instance, contact with family and friends. | More negative symptoms at baseline (P = 0.02) and more distress caused by these symptoms (P = 0.05) predicted improved psychological health, but not on social relations (P = 0.01). More distress caused by positive symptoms (P = 0.05) and a longer duration of illness (P = 0.06) predicted improved social relations. Those with higher distress from negative symptoms had significantly less chance of improving on social relations (P = 0.01). | **Symptomology:** the participants in the experimental condition had statistically significant, fewer negative symptoms (P = 0.02) and less distress from these symptoms (P = 0.04) in comparison with the participants in the control condition. In addition, no between-condition differences were found in hospitalization rates (P = 0.28) during the intervention.<br><br>For self-efficacy, self- esteem, and self-reported quality of life, no between-condition differences were found, but participants in both conditions improved over the study period.<br><br>The high attender group significantly improved on social support, self-efficacy, and quality of life compared with the low attender group. | This first RCT on peer support groups for people with psychosis demonstrates that this intervention is effective in improving their social network by encouraging mutual relationships and in enhancing their appraisal support. |
| Calsyn, 1998 | Social network size; Arizona Social Support Interview Schedule with additional items; Personality and Social Network Adjustment Scale | **Study 2:** There was a significant treatment group effect on the network size variables, Wilks Lamda (6, 252) 4 .84, p , .0001. Although there was no significant difference between treatment groups in terms of the size of the natural support network, there was a significant difference in the size of the professional network, F (2, 126) 4 10.47, p , .0001. | **Study 2:** There were no significant treatment group differences on the emotional, ad-vice, recreational and conflict dimensions. However, there was a significant treatment group difference on the material assistance dimension, F (2, 122) 4 7.20, p , .001.<br><br>There were no significant effects of treatment group, time, or treatment group by time on the qualitative measures of social relation- ships. There was a significant effect of treatment on the interviewers' ratings of the adequacy of the social network, Wilks Lambda (6, 232) 4 .73, p , .0001. | None reported. | Only limited support for the hypotheses that ACT increases the social support of people with severe mental illness who are homeless. The most consistent finding across both studies was that clients served by ACT programs had significantly larger professional support networks than clients served by the other programs. This finding is consistent with the ACT treatment approach that calls for intensive staff intervention and a team approach. |

Supplementary File 1: Data Extraction Table

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| Tempier et al 2012 | Social network size; functional adequacy of social support as measured by the gap between ideal and perceived levels of support. | The mean network size was not statistically different between groups at 6 months, although there was a trend toward bigger networks among specialized care patients. When members of the patient's network were classified by role, for example, parent or sibling, participants in the specialized care group tended to report more responses for each role, suggesting that their net- works were denser.<br><br>At 18 months, the intervention group had a significantly larger network than the standard care group. | A comparison of emotional and practical support subscales of the SOS showed no difference between groups in ideal and perceived levels of support. For all subscales, the perceived level of support was less than the ideal level. | No significant differences were found in either clinical outcome measures between the two treatment groups at six- month follow-up.<br><br>At 18 month follow-up the intervention group scored significantly better on the negative PANSS, total PANSS, and GAF. | Early intervention by using an ACT model of care may improve clinical results by reestablishing or maintaining bonds between patients and family, friends, and acquaintances. |
| Johnson et al 2018 | Lubben Social Network Scale | At 4 and 18 months, there was little evidence of any effect; the difference in social networks favoured the intervention but it was not statistically significant | None. | Readmission to acute care within 1 year was significantly lower in the intervention group than in the control group. Time to readmission was significantly longer in the intervention than in the control. However, the number of days in acute care was not significantly different. Participants in the intervention group had fewer days in acute care than did participants in the control group, but the difference was not significant.<br><br>At 4 months of follow-up, overall satisfaction with mental health-care received was greater in the intervention group than in the control group.<br><br>There was also a significant difference in self-rated recovery favouring the intervention, but the difference was not significant in | Our findings suggest that peer-delivered self-management reduces readmission to acute care, although admission rates were lower than anticipated and confidence intervals were relatively wide. The complexity of the study intervention limits interpretability, but assessment is warranted of whether implementing this intervention in routine settings reduces acute care readmission. |

Supplementary File 1: Data Extraction Table

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| | | | | sensitivity analysis with adjustment for predictors of missingness. | |
| Ammerman (2013) | Social Network Index. Network Size Subscale; Network Diversity Subscale; Network Embeddedness Subscale. | No group differences were found in size of and involvement with social networks. For each scale, both groups either remained stable over time or showed increases over time. | Those receiving IH-CBT reported increased social support over time relative to those in the SHV condition. Effect sizes were modest at post-treatment (ES=0.38) but increased at follow-up (ES=0.65).<br><br>Improvements were seen in affiliative and belonginess aspects of social support, in contrast to tangible support which was statistically non-significant. Findings were not moderated by clinical features of depression or home visiting parameters. | Subjects receiving IH-CBT reported decreased psychological distress at post- treatment (ES=0.77) and follow-up (ES=0.73). Examination of types of psychological distress indicated broad improvements at both time points. | IH-CBT is effective in reducing psychological distress and improving perceived social support in depressed mothers receiving home visiting. IH-CBT is a feasible, readily adopted treatment that is compatible with multiple home visiting models. As a result it is a promis- ing approach to help depressed mothers in home visiting. Additional interventions may be needed to support depressed mothers in building sizable and stable social networks. |
| Rivera, 2007 | Pattison Network Inventory (31,32). This interview assessed social network size, total number of social contacts, degree of reciprocity of relationships, density of the social network, and the number of times the client was helped or had helped others in his or her network. | Clients receiving peer-assisted care showed a significant increase in the number of contacts from baseline to 12 months. Follow-up analyses revealed that this effect was due to increased contact with peer assistants and professional staff, not with family and outside friends. There were also significant improvements for all conditions in several other network measures as indicated by reliable main effects of time: total number of others involved in social activities, total number of others who helped client, total number of others helped by client, and network density.<br><br>Peer-assisted care showed the greatest increase in self-reported social contacts with consumer and professional staff. Peer assistants provided planned activities and regularly scheduled home | | Data indicate that although the three programs had distinct patterns of services, they yielded the same general pattern of improvement over time on a variety of measures: symptoms, health care satisfaction, and various ratings of the quality of life. Clients in the three programs also showed similar but small changes in measures of social network behavior. No one program emerged as categorically superior to the others. | Although the work of peers enhanced the social networks of consumers, this did not translate into measurable changes in treatment outcome. |

Supplementary File 1: Data Extraction Table

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| | | visits to enhance the social network. These increases did not extend to kin social contacts, | | | |

Supplementary File 1: Data Extraction Table

| **Risk of bias assessments** | | | | | |
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| **STUDY ID:** | **Selection bias** | **Allocation bias: comparability at baseline and concealment** | **Blinding of outcome assessment** | **Incomplete outcome assessment** | **Adherence to intervention** |
| Terzian et al 2013 | Low | Low | High | Low | Unclear |
| Sheridan, 2015 | Low | Low | Low | High | Unclear |
| Thorup, 2006 | Unclear | Low | Unclear | High | Unclear |
| Castelein, 2008 | Low | Low | High | Low | Low |
| Calsyn, 1998 | Unclear | Unclear | Unclear | Unclear | Unclear |
| Tempier et al 2012 | Low | Low | Low | Unclear | Unclear |
| Johnson et al 2018 | High | Low | Low | Low | Low |
| Ammerman (2013) | Low | Low | Unclear | Low | Unclear |
| Rivera, 2007 | Unclear | Low | Unclear | Low | Unclear |

High risk: One high-risk classification within domains
Low risk: All low-risk classifications across domains.
Unclear: One unclear classification within domains.