Loneliness and Mental Health in a Randomised Controlled Trial of a Peer-provided Self-management Intervention for People Leaving Crisis Resolution Teams

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PhD Thesis

I, Jingyi Wang, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signed:

Date:

Abstract

Background

Loneliness is more prevalent among people with mental health problems than in the general population. However, loneliness has not been a particularly prominent focus in recent research on outcomes of mental illness. Loneliness interventions have also received little attention.

Aims

1) To review literature for the definition and conceptual model of loneliness and its closely related concepts, and for well-developed measures of these concepts.
2) To systematically review the impact of loneliness and perceived social support on mental health outcomes
3) To explore the severity of loneliness among people leaving Crisis Resolution Teams (CRTs), and identify factors cross-sectionally associated with loneliness.
4) To determine whether loneliness at baseline predicts poor outcomes at 4-month follow-up, including overall symptom severity, affective symptoms, self-rated recovery and health-related quality of life.
5) To examine whether there is any difference in loneliness at 4-month follow-up between a peer-provided self-management intervention group and a control group in a randomised controlled trial.

Method

A conceptual framework of loneliness and related concepts was developed and measures identified of main concepts. A systematic review of longitudinal studies examining the effect of loneliness and perceived social support on mental illness prognosis was conducted.

The sample (n=399) was taken from patients participating in a research trial from CRTs. Participants in the trial intervention group were offered up to ten meetings by a peer support worker and a self-management workbook. Participants in the control group were only provided a self-management workbook. Respondents (n=310) completed the follow-up measurement four months after baseline.

Results

A model with five domains was proposed to incorporate all terms relating to loneliness. Well-developed measures assessing each domain or covering multi-domains were identified. Perceived social support and loneliness were associated with mental health outcomes.

The severity of loneliness was high among people leaving CRTs. Greater loneliness was significantly associated with small social network size, limited social capital, severe affective symptoms and long-term mental illness history.

Greater loneliness at baseline predicted poorer health-related quality of life at 4-month follow-up. Loneliness was also a better predictor of clinical outcomes than objective social isolation and social capital.

Loneliness at follow-up was not significantly different between the intervention group and the control group.

Discussion

Loneliness is an important issue in mental health service users. It could be a promising target to improve recovery for people with mental health problems. The efficacy of peer-provided self-management intervention on loneliness was not confirmed. More research is necessary to explore beneficial loneliness interventions so as to aid the development of recovery-oriented mental health services.

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Chapter 1: Introduction

This thesis examines the epidemiology of loneliness and its relationship to recovery for people following a mental health crisis, and tests the efficacy of a peer-provided self-management intervention for alleviating loneliness. In this chapter, the background to the issue of loneliness among people with mental health problems is described. The aims of the thesis are presented and the study context is explained.

1.1 Loneliness and mental health

Loneliness can be defined as a negative emotional state that occurs when there is a discrepancy between the desired and achieved patterns of social interaction (Sermat 1978, Peplau and Perlman 1979, Peplau and Perlman 1982). From the point of view of needs for intimacy, loneliness is caused not by being alone but by an unsatisfied inherent set of social needs (Weiss 1973, Peplau and Perlman 1982). Loneliness can also be viewed in part as "a response to the absence of important social reinforcements" when social relations are considered as a particular class of reinforcement (Young 1982). Loneliness is similar to subjective social isolation, rather than objective social isolation (Wang, Lloyd-Evans et al. 2016). Individuals are likely to live relatively solitary lives without feelings of loneliness, and inversely, they can live a superficially rich social life and feel lonely nonetheless (Hawkley and Cacioppo 2010).

Mild feelings of loneliness can potentially motivate connection or reconnection with others as the desire to avoid loneliness and the need to belong provides a motivational force to build social relations, thereby attenuating or eliminating feelings of loneliness (Heinrich and Gullone 2006, Hawkley and Cacioppo 2010). However, chronic loneliness is experienced by approximately 10–15%

of the general population across all ages (Jopling and Sserwanja 2016). Feelings of loneliness are more prevalent among people with mental health problems than in the general population (Borge, Martinsen et al. 1999, Lauder, Sharkey et al. 2004). For people with depression, cross-sectional studies have found up to 40% of respondents feeling lonely all or most of the time (Victor and Yang 2012), with a tenfold increase in the odds of being lonely compared to the general population (Meltzer, Bebbington et al. 2013). In a study among older adults with major depression, minor depression, or dysthymia, 83% of the respondents reported loneliness and 38% reported severe loneliness (Holvast, Burger et al. 2015). By comparison, only 32% of elderly people in the general population were lonely and 4% severely lonely using the same loneliness scale (van Tilburg and de Jong Gierveld 1999). In a comparison of people with psychosis and a general population sample with similar demographic characteristics, the prevalence of loneliness among people with psychosis was 79.9% compared with 35% in the general population (Badcock, Shah et al. 2015).

Correlates and predictors of loneliness have been reported in existing literature. Among community adults, risk factors for loneliness included non-married status, no employment, domestic violence, and more children in a household (Lauder, Sharkey et al. 2004). A review of correlates of loneliness in older population found that people with "female gender, non-married status, older age, poor income, lower educational level, low quality of social relationships, poor self-reported health, poor functional status, poor mental health, low self-efficacy beliefs, negative life events, and cognitive deficits" were more likely to feel lonely (Cohen-Mansfield, Hazan et al. 2016). Vulnerability and protective factors for loneliness in people with mental health problems have been rarely studied. Preliminary evidence showed that people with psychotic disorders who experienced greater feelings of loneliness had

more severe internalised stigma, worse interpersonal competence, lower self-efficacy, lower self-esteem, lesser social support, smaller social network, poorer community integration, more severe social isolation, and greater number of psychiatric inpatient admissions, however socio-demographic characteristics did not play an important role in explaining variation in loneliness in this population (Badcock, Shah et al. 2015, Chrostek, Grygiel et al. 2016, Shioda, Tadaka et al. 2016).

People with mental health problems are often socially isolated and lonely. On the one hand, severe mental illness is known to negatively influence people's capability to establish and sustain relationships (Hamilton, Ponzoha et al. 1989, Bradshaw and Haddock 1998). For people with schizophrenia, the illness often begins in late adolescence and hampers the development of social skills, thus making them increasingly withdrawn and even susceptible to severe social anxiety that may contribute to losing existing friends (Bradshaw and Haddock 1998). The severity of psychopathology of psychotic disorders also predisposes an individual to loneliness, especially subjective thought disorder and loss of pleasure (Badcock, Shah et al. 2015), which may preclude a person from having meaningful social interactions. Depression and loneliness are causally related to each other in a circular relationship (Weeks, Michela et al. 1980, Dill and Anderson 1999). People with depression sometimes have an urge to avoid social contact and isolate themselves from others, or unintentionally drive away their friends by repeated reassurance seeking (Dill and Anderson 1999). On the other hand, stigmatisation is believed to be one of the main reasons for experiencing loneliness among mental health service users (Perese and Wolf 2005). Stigma has an obvious effect on breaking an individual's social ties through rejection by other people and discrimination in various areas of life (Wahl 1999). Fear of the mentally ill and belief in increased risk of harming others, for example, may interfere with the ability of people with

severe mental disorders to use their social skills and may create barriers between them and their communities (Borinstein 1992, Perese and Wolf 2005, Wang, He et al. 2013). Another kind of stigmatisation is the attitudes and reactions of the stigmatised themselves, namely internalised stigma (Switaj, Grygiel et al. 2014). People experiencing mental health problems may accept negative stereotypes of mental disorders and withdraw from social interactions for fear of rejection by others, which results in low self-esteem, poor social relations and feelings of loneliness (Corrigan 2005, Corrigan, Larson et al. 2009, Switaj, Grygiel et al. 2014).

The effect of loneliness on health has been studied a lot among people with physical illness (Hawkley and Cacioppo 2010, Petitte, Mallow et al. 2015). For instance, two meta-analytic reviews have reported that loneliness is associated with higher mortality rates, and that the effect is comparable with some well-established risk factors such as obesity, physical inactivity, and smoking (Holt-Lunstad, Smith et al. 2010, Holt-Lunstad, Smith et al. 2015). Loneliness is also predictive of development of coronary heart disease and stroke (Valtorta, Kanaan et al. 2016), increases in systolic blood pressure (Hawkley, Thisted et al. 2010), and chronic pain (Jaremka, Andridge et al. 2014) in longitudinal studies. However, there is not much evidence in general of prevalence, associations, and impact on prognosis, of loneliness among people with mental illness. Some previous studies report loneliness has been associated with psychosis (Badcock, Shah et al. 2015, Chrostek, Grygiel et al. 2016), depression (Meltzer, Bebbington et al. 2013) and increases in depressive symptoms (Cacioppo, Hughes et al. 2006), personality disorders (Martens 2010), suicide (Goldsmith, Pellmar et al. 2002), impaired cognitive performance and cognitive decline (Tilvis, Kahonen-Vare et al. 2004), increased risk of Alzheimer's Disease (Wilson, Krueger et al. 2007), and diminished executive control (Hawkley, Thisted et al. 2009). However,

loneliness has not been a particularly prominent focus in recent research on outcomes of mental illness, and most of the existing studies are cross-sectional research, from which causal relationships cannot be inferred.

As loneliness is an established risk factor for health, a number of loneliness reduction interventions have been developed (Masi, Chen et al. 2011). A Meta-analysis of loneliness interventions indicated four primary strategies: "(1) improving social skills, (2) enhancing social support, (3) increasing opportunities for social contact, and (4) addressing maladaptive social cognition" (Masi, Chen et al. 2011). A recent review of which I am a co-author of the state of the art in loneliness interventions among people with mental health problems categorised interventions as 'direct' approaches including 1) changing cognitions which aims to mitigate maladaptive cognitions, 2) social skills training and psychoeducation which focus on improving social skills, 3) supported socialisation or having a 'socially-focused supporter' which is offered by a specific supporter to provide help and advice on finding new activities or groups and on making and maintaining social connections, and 4) wider community groups which help mental health service users integrate into a wider society, as well as 'indirect' broader approaches such as initiatives to improve employment opportunities (Mann, Bone et al. 2017). However, there is not as yet a robust evidence base for any types of intervention (Mann, Bone et al. 2017). Some approaches show promise of reducing loneliness, but flawed design often impedes proper evaluation of efficacy (Cohen-Mansfield and Perach 2015). Masi and colleagues (Masi, Chen et al. 2011) indicated in their meta-analysis that single-group pre-post studies and nonrandomised group comparison studies should be viewed with caution. In contrast, randomised group comparison studies have the advantage of eliminating selection bias and minimising the effect of regression toward the mean (Masi, Chen et al. 2011). Considering that loneliness intervention has received little attention in

mental health research, a well-designed, high quality trial of a specific intervention in people with mental health problems is needed.

1.2 The setting for this study

Longitudinal research is necessary to examine the relationship between loneliness and outcomes of mental illness, and a randomised controlled trial (RCT) is of value to explore beneficial loneliness interventions. A nationally funded RCT of a peer-provided programme of support for people following treatment for a mental health crisis by a Crisis Resolution Team (CRT) offered an opportunity to address these research needs, by exploring the course of loneliness and health outcomes in a group of trial participants with a variety of mental health conditions. CRTs, also known as home treatment teams, offer rapid assessment to people with mental health crises and refer them to the most suitable service (Health 2001). CRTs also provide intensive home treatment for individuals who are suitable for community based treatment as an alternative to inpatient care (Health 2001). CRT users are clinically a very mixed group of secondary mental health service users including all diagnoses and a mixture of long-term and short-term illness, so it is a good group for researchers to understand the extent and course of loneliness for people with relatively severe mental health problems. Additionally, studying people all of whom are immediately post mental health crisis is useful because it offers a genuine baseline, with everyone starting from a shared experience of acute service use, and because predictors of recovery are particularly relevant for a group of people who have just experienced mental health crisis.

1.3 Aims of the thesis

The aims of the thesis are presented below, followed by research questions and hypotheses:

- to provide an overview of the definition of loneliness and its closely related

concepts, then to propose a conceptual model to distinguish and fit all these concepts, and identify well-developed measures of these concepts.

- to systematically review the evidence as to whether loneliness and perceived social support predict outcomes of mental health problems.

- to describe the development of peer-provided self-management interventions and their effect on mental illness and social relationships, and provide potential mechanisms of their benefits.

- to provide a quantitative assessment of loneliness, explore the severity of loneliness among people leaving CRTs, and identify factors independently associated with loneliness in cross-sectional analyses.

- to determine whether loneliness at baseline (discharge from a CRT service) independently predicts poor outcomes at 4-month follow-up among CRT users, including overall symptom severity, affective symptoms, self-rated recovery and health-related quality of life.

- to examine whether there is any difference in loneliness at 4-month follow-up between participants who were offered the peer-provided self-management intervention and those in the control group who were not in a randomised controlled trial.

The quantitative investigation of loneliness will focus on four research questions and five hypotheses:

1) What is the severity of loneliness among people leaving CRTs?
2) What factors are cross-sectionally associated with loneliness?
3) Does loneliness at baseline predict poor outcomes at 4-month follow-up?

   Hypotheses:

   a) Greater loneliness at baseline will predict more severe overall symptoms at 4-month follow-up.

   b) Greater loneliness at baseline will predict more severe affective

symptoms at 4-month follow-up.

    c) Greater loneliness at baseline will predict poorer self-rated recovery at 4-month follow-up.

    d) Greater loneliness at baseline will predict poorer health-related quality of life at 4-month follow-up.

4) Do the feelings of loneliness differ between participants in the peer-provided self-management intervention group and those in the control group?

Hypothesis:

    e) Participants in the intervention group will report less loneliness than those in the control group at 4-month follow-up.

This thesis contributes to improving conceptual clarity about loneliness and its closely related terms and identifying their most appropriate measures for use in mental health settings. A systematic review of literature regarding the associations between loneliness and perceived social support and outcomes of mental health problems can identify the existing evidence base regarding their potential influence on various mental illnesses. The description of epidemiology of loneliness contributes to the understanding of levels of loneliness among CRT users and the potential correlates of loneliness. The examination of longitudinal associations between loneliness and outcomes of mental health problems can help identify whether loneliness is a useful target to improve recovery for this post-CRT clinical population. The test of the efficacy of peer-provided self-management intervention in loneliness can aid understanding of whether this intervention is effective in reducing loneliness among people following mental health crisis.

1.4 Relationship of the thesis to the CORE study

Data for this thesis were collected as part of the CORE study (CRT Optimisation and RElapse prevention) (Johnson, Mason et al. 2017): "a

multi-site randomised controlled trial of a peer-provided self-management intervention for people leaving crisis resolution teams (CRTs)". The CORE study was funded by the National Institute for Health Research. A pilot study was conducted initially, which included focus groups with stakeholders for development of the intervention and preliminarily tested the intervention with a small number of people with mental health problems. The main trial aimed to explore if the peer-provided, self-management programme can reduce relapse and promote recovery. Participants in the intervention group received up to ten meetings with a peer support worker and a self-management workbook to complete. The self-management workbook was also provided for participants in the control group but no help from a peer support worker. A loneliness scale was added to both baseline and follow-up interviews at my request in order to allow the prevalence and impact of loneliness to be examined. The randomised controlled trial helped evaluate the impact of peer-provided self-management intervention on loneliness. A review of social network interventions provided some evidence that peer support programmes may be able to increase social networks for people with psychosis (Anderson, Laxhman et al. 2015), so it is reasonable to examine whether a peer supported intervention can reduce loneliness. Although loneliness was one of the secondary outcomes of the main trial and the RCT was not specifically designed for alleviating loneliness, peer support workers may play a role as socially-focused supporter to attenuate participants' feelings of loneliness by establishing a good relationship with their clients or by offering social support themselves. Peer support workers also helped participants in the intervention group to complete the self-management workbook which involves socially-orientated goal-setting. Peer workers may help participants to reduce loneliness by encouraging them to set and achieve goals involving increasing social networks and activities and obtaining support from other people.

The following components of this thesis were guided by decisions already made concerning the structure of the CORE study:

- Choice of crisis resolution teams participating in the quantitative study in this thesis (Chapter 6-9).

- Choice of measures used in the quantitative study in this thesis except the UCLA Loneliness Scale (Chapter 6-9).

- Sampling frame and sample size used in the quantitative study in this thesis (Chapter 6-9).

- Design of the intervention and procedures of the trial used in the quantitative study in this thesis (Chapter 6-9).

Except where acknowledged, all other elements of this thesis represent the author's own work.

Chapter 2: Loneliness and its closely related concepts

Loneliness is an indicator related to social relationships in this thesis. A paragraph of Chapter 1 included some definitions of loneliness. In order to comprehend loneliness better, it is necessary to understand the concept of loneliness and how it relates to other concepts of social relations in the field of mental health. There are a variety of social relationship concepts which have been used in mental health research. However, the boundaries between loneliness and related terms are often blurred and there is overlap between their dimensions. A clear consensus has not been reached on how they differ and when to use each. Thus this chapter offers a detailed narrative account of existing definitions of loneliness and its closely related concepts such as social isolation, social network, social support, social capital, confiding relationships, and alienation, and explains how they relate to loneliness. Then in Chapter 3, a conceptual model to include all these concepts will be proposed to make it clear how they overlap with and distinguish between one another, and well established measures for each conceptual domain will be provided.

2.1 Loneliness

Loneliness is defined as an unpleasant feeling resulting from the discrepancy between expected and actual social relationships (Sermat 1978, Peplau and Perlman 1979, Peplau and Perlman 1982). Another often cited definition of loneliness is a state of negative affectivity accompanying the perception that one's social needs are not being met by the quantity or especially the quality of one's social relationships (Peplau and Perlman 1982, Wheeler, Reis et al. 1983, Pinquart and Sorensen 2001, Hawkley, Hughes et al. 2008). A consensus on the definition of loneliness has not been reached by various researchers, though, three common assumptions have been summarised (Peplau and Perlman 1982, Bekhet, Zauszniewski et al. 2008): (1) perceived

deficiencies in one's social relationships; (2) a subjective state, as distinguished from the objective state of social isolation; and (3) an unpleasant and distressing experience.

Loneliness can be regarded as multifaceted. Weiss (Weiss 1973) proposed a multidimensional concept of loneliness, categorising loneliness into social and emotional dimensions. Social loneliness derived from "the absence of socially integrative relationships", while emotional loneliness stemmed from the absence of "a close emotional attachment" (Weiss 1973). Social loneliness occurs when a person does not have a wider social network as desired, which can lead to the feelings of boredom, exclusion and marginality e.g., the feeling of a child whose friends are all away (Weiss 1973, Gierveld and Van Tilburg 2006). In contrast, emotional loneliness occurs when someone is missing an intimate relationship, which can result in distress and apprehension e.g., the feeling of a child who is afraid of being abandoned by parents (Weiss 1973, Gierveld and Van Tilburg 2006). Based on this categorisation, Weiss (Weiss 1974) conceived a model of social provisions in the context of loneliness with six components – attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity for nurturance. Attachment is emotional intimacy where a person obtains a sense of security; social integration is a feeling of belonging to a network of relationships where people share analogous interests and attitudes; reassurance of worth is the acknowledgement of an individual's abilities and value by other people; reliable alliance is the trust that one can count on others for practical support; guidance is the belief that one can count on others for suggestions or information; and opportunity for nurturance is a feeling that one is responsible for other people's wellbeing (Weiss 1974). These components were claimed to be necessary in order to avoid loneliness (Weiss 1974), especially attachment and social integration. A deficiency of attachment is associated with emotional loneliness,

and a deficiency of social integration is related to social loneliness (Russell, Cutrona et al. 1984).

Experiencing loneliness needs to be distinguished from being frequently alone. A person who lives alone might not experience loneliness and vice versa, though older persons living alone were reported to be twice as likely to feel lonely (24.2% versus 10.9%) (Lim and Kua 2011). In contrast, living alone was not associated with loneliness in people with psychosis after adjusting for other potential correlates (Chrostek, Grygiel et al. 2016). Moreover, the effect of being alone on mental illness is not as strong as loneliness. For example, in a prospective study of risk factors for depression in elderly people, feelings of loneliness predicted the onset of depression over 3-year follow-up, however living alone, the more objective factor, failed to predict the development of depression (Green, Copeland et al. 1992). Similarly, loneliness predicted more severe depressive symptoms after 2 years among community-dwelling older adults but living alone did not (Lim and Kua 2011).

2.2 Social isolation

Nicholson (Nicholson 2009) undertook an evolutionary concept analysis to identify the definition and attributes of social isolation as experienced by older adults. The evolutionary concept analysis involves identification of the concept's attributes, antecedents, consequences, relevant terms, contextual basis and implications for further conceptual development (Rodgers 2000). This approach is useful for clarifying and developing conceptual notions which indicate time-related changes in concepts (Rodgers 2000). Five aspects of social isolation were proposed in Nicholson's paper - "number of contacts, feeling of belonging, fulfilling relationships, engagement with others, and quality of network members" (Nicholson 2009). Zavaleta and colleagues (Zavaleta, Samuel et al. 2014), in a review of social isolation not specific to a mental health context, defined social isolation as "the inadequate quality and

quantity of social relations with other people at the different levels where human interaction takes place (individual, group, community and the larger social environment)". They distinguished two domains of social isolation: external and internal characteristics. External characteristics, also known as objective social isolation, refer to observable social contacts, namely having few or no meaningful relationships with others (de Jong Gierueld, Tilburg et al. 2006, Zavaleta, Samuel et al. 2014). Conversely, internal characteristics, also labelled as subjective social isolation, refer to personal attitudes not quantifiable by observation, such as trust, satisfaction with relationships and loneliness (Zavaleta, Samuel et al. 2014). The Nicholson and Zavaleta models of social isolation both include objective social contact and subjective perceived adequacy of contact within one overarching construct of social isolation. In addition, Warren (Warren 1993) proposed four criteria relating to the quality of someone's social environment and relationships as essential ingredients of social isolation: stigmatised environment (an individual being negatively appraised as different from other people because of appearance, behaviour or tribe), societal indifference, personal-societal disconnection, and personal powerlessness.

Both social isolation and loneliness describe an adverse condition due to insufficient quantity or quality of social relationships, however they are not synonymous concepts. External social isolation is objectively measured in terms of social network size and/or frequency of contact with others, while loneliness can only be described – subjectively – by a person him/herself (Andersson 1998, Routasalo, Savikko et al. 2006). Routasalo and colleagues (Routasalo, Savikko et al. 2006) measured experience of loneliness, number of friends, frequency of interaction with friends and children, as well as expectations and satisfaction of the interaction among aged Finnish citizens. They found that the number of friends and the frequency of interaction with

friends and children were not associated with the feelings of loneliness whereas the expectations and satisfaction of the interaction predicted loneliness (Routasalo, Savikko et al. 2006). Thus loneliness differs from objective social isolation but may overlap with subjective social isolation.

2.3 Social network

Social network refers to "a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behaviour of the persons involved" (Mitchell 1969). Social network analysis can measure "morphological" and "interactional" characteristics of networks (Cohen and Sokolovsky 1978). Morphological characteristics refer to quantitative properties of a network. It includes size (number of contacts), degree (average number of links each person in network has with others in the network), and density (actual links between network members as a proportion of all possible links) (Cohen and Sokolovsky 1978). Interactional characteristics refer to the nature of relationships. They include intensity: whether relationships are "uniplex" (one function only) or "multiplex" (more than one function); and directionality: who is helping whom in a dyadic relationship (Cohen and Sokolovsky 1978).

Considering the characteristics of social network, it is different from loneliness and its measures are more objective compared with subjective measures of loneliness. Its association with loneliness is complicated and varies among different domains. In a study among older Canadians, fewer close relatives (but not lack of contact with relatives in the last week) was significantly associated with loneliness (Gierveld, Keating et al. 2015). Conversely, lack of contact with friends in the last week (but not fewer number of close friends) explained feelings of loneliness. The authors explained that kin contact is more obligatory, so having close relatives is likely to offer a feeling that the

participants could receive support when they need it even without recent contact (Gierveld, Keating et al. 2015). In contrast, friendships are not mandatory and thus having contact with friends recently is proof of the intensity of the relations.

2.4 Social support

Social support can be described as the degree to which a person's basic social needs are gratified through interaction with other people (Thoits 1982, Amick and Ockene 1994). It is the resources both tangible and intangible that other people provide (Amick and Ockene 1994). It is also a perception of an individual that he or she can count on others for help in the time of crises (Amick and Ockene 1994).

Two main conceptualisations of social support have been distinguished: functional and structural (Sanchez Moreno 2004). The structural perspective emphasises the existence, quantity, and properties of an individual's social relations (Sanchez Moreno 2004). The functional viewpoint attempts to determine which functions are fulfilled by the person's social relations (Sanchez Moreno 2004). The functions most often cited are (1) emotional support which involves caring, love and empathy, (2) instrumental support which refers to practical support and tangible aid, (3) informational support which consists of information, guidance or feedback that can provide a solution to a problem, (4) appraisal support which involves information relevant to self-evaluation and, (5) social companionship, which involves spending time with others in leisure and recreational activities (House 1981, Cohen and Hoberman 1983, Wills 1985). Many measures of social support assess three components, spanning both structural and functional domains: (a) social network and social integration variables (i.e., diversity/number of relationships), (b) received support (i.e., how often supportive behaviours are received), and (c) perceived support (i.e., support the person believes to be available if he or

she should need it) (Hupcey 1998, Dour, Wiley et al. 2014). Cobb (Cobb 1979) proposes the mutuality of obligation in relations with others, as well as the functional support received by an individual from others, as a component of social support.

Unlike social network which almost exclusively has been regarded as an objective fact, social support covers both objective and subjective aspects. Perceived social support, especially emotional support and social companionship, resembles loneliness as subjective evaluations of the quality and impact of social relationships. Studies have found negative correlations between loneliness and perceived social support (Lasgaard, Nielsen et al. 2010, Pamukcu and Meydana 2010, Salimi and Bozorgpour 2012, Chrostek, Grygiel et al. 2016). For instance, in a study among university students, perceived support from family (r = -0.53), friends (r = -0.52), and a significant other (r = -0.73) all had significant negative correlations with loneliness (Salimi and Bozorgpour 2012).

2.5 Social capital

Social capital is generally understood as "a series of resources that individuals earn as a result of their membership in social networks, and the features of those networks that facilitate individual or collective actions" (Portes 1998, Putnam 2000, McKenzie, Whitley et al. 2002). The widely used definition of social capital in health sciences originates with Putnam (Putnam 2000, De Silva, McKenzie et al. 2005). By analogy with concepts of physical capital and human capital (tools and training that improve individual productivity), social capital refers to "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (Putnam 2000). Putnam (Putnam 1993) indicated that social capital included five main characteristics: "(1) community networks, voluntary, state, individual networks, and density; (2) civic engagement, participation, and use of civic

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networks; (3) local civic identity—sense of belonging, solidarity, and equality with other members; (4) reciprocity and norms of cooperation, a sense of obligation to help others, and confidence in return of assistance; (5) trust in the community". Similarly, Kim and Harris (Kim and Harris 2013) proposed five domains of social capital: trust, social norms, information sharing, partnership with community, and political participation.

The concept of social capital emphasises multiple dimensions. It can be divided into a behavioural/activity component (structural social capital) and a cognitive/perceptual component (cognitive social capital) (Bain and Hicks 1998, De Silva, McKenzie et al. 2005). Structural social capital refers to relatively objective and externally observable social structures, such as established roles, social networks and other structures which can facilitate information sharing and participation (Grootaert and van Bastelaer 2002). Cognitive social capital comprises more subjective and intangible elements, such as shared norms, values, trust, attitudes and beliefs (Grootaert and van Bastelaer 2002). In addition, social capital has both an individual and a collective aspect – a private and a public face (Putnam 2000). It can be considered a property of communities (an ecological construct) or of individuals. Individual social capital is most widely measured by asking people about their participation in social relationships (for example, membership of groups) and their appraisals of the quality of those relationships (De Silva, McKenzie et al. 2005). Ecological social capital has been commonly assessed by aggregating the responses of a representative sample of a community (De Silva, McKenzie et al. 2005, De Silva, Harpham et al. 2006). Two components of social capital have also been proposed (De Silva, McKenzie et al. 2005, Siegler 2015): "Bonding" social capital describes closer connections between people with a family connection or shared group identity, and is typically the source of most of someone's emotional and instrumental social support. "Bridging" social capital describes

more distant connections between people not directly linked to friends or family, with distinctions or distance between them – for example people from different classes or ethnic communities. This distinction mirrors that made by Granovetter (Granovetter 1973) between "strong ties" and "weak ties" with others in a person's social network.

Social capital is distinguished from loneliness, although its cognitive aspect could be associated with loneliness. A population-based survey in Finland measured structural and cognitive social capital by asking respondents the frequency of their social interaction, engagement in organisational activities, trust and feelings of belonging to the community (Nyqvist, Victor et al. 2016). They found that a lower degree of trust was related to greater loneliness across all age groups, however the relationships between other domains of social capital and loneliness were inconsistent in different age groups (Nyqvist, Victor et al. 2016). In another cross-sectional study, the aspects of social capital included social support, social networks, neighbourliness, civic participation, and perceptions of the local community, but most indicators of social capital were not associated with loneliness except perceived social support (Lauder, Mummery et al. 2006). In contrast, Coll-Planas and colleagues (Coll-Planas, Gomez et al. 2017) conducted an intervention based on social capital theory among older adults and reported that both emotional and social loneliness decreased significantly at 2-year follow-up after the intervention. Regarding the impact of social capital on mental disorders, a systematic review supported the inverse relationship between cognitive social capital and mental illness at the individual level, however the associations between structural or ecological social capital and mental illness were unclear and warrant further investigation (De Silva, McKenzie et al. 2005).

2.6 Confiding relationships

Measures of confiding relationships rate the degree of closeness to and intimacy someone has with other people (Brown and Harris 1978, Murphy 1982). For example, intimate relationships with a spouse, or with a friend who was seen on a regular basis and could be relied on to give advice, were considered "good confidant", while "poor or no confidant" refers to conflicted relationships with a spouse, an unsteady relationship or no one to confide in at all (Emmerson, Burvill et al. 1989). Since their seminal 1978 paper on the social origins of depression, which established the lack of a confiding relationship as a risk factor for depression, Brown and Harris have emphasised the desirability of separating out: the degree of confiding in a relationship, which may be influenced by both parties' attachment style and perception of the other; and the active emotional support given by a confidant (Brown, Andrews et al. 1986). This mirrors the distinction between perceived and received support in the social support literature.

Confiding relationships measure the quality of specific important relations, e.g. with a spouse or with a friend, while loneliness refers to the overall appraisal of perceived adequacy or impact of people's relations. It is understandable that if a person doesn't have a confiding relationship, a perceived deficiency would appear in his or her social world. An exploration of the mechanisms of befriending (often referred to as 'friendly visitor' or 'senior companion' programmes) for older adults suggested that befrienders seemed to supply emotional support through development of reciprocal, safe, and confiding relationships, and thus decrease loneliness and depression (Lester, Mead et al. 2012).

2.7 Alienation

Bronfenbrenner (Bronfenbrenner 1979) defined alienation as "the feeling of disconnectedness from social settings such that the individual views his/her relationships from social contexts as no longer tenable". Five basic ways where the concept of alienation has been used were discussed by Marxist and existentialist scholars (Seeman 1959, Maddi 1967, Moszaros 1970, Seeman 1975): Powerlessness, Meaninglessness, Normlessness, Isolation and Self-Estrangement. Powerlessness originated in the Marxian view that the worker is alienated when the prerogative and means of decision are deprived in capitalist society (Seeman 1959). In Seeman's paper, powerlessness can be conceived beyond the industrial sphere as "the expectancy or probability held by the individual that his own behavior cannot determine the occurrence of the outcomes, or reinforcements, he seeks" (Seeman 1959). Meaninglessness refers to lack of understanding of the events in which an individual is involved, especially "when the individual's minimal standards for clarity in decision-making are not met" (Seeman 1959). Normlessness is derived from Durkheim's concept of anomie (Durkheim 1951 [1897]). Seeman (Seeman 1959) defined an anomic situation as one where there is a "high expectancy that socially unapproved behaviors are required to achieve given goals". Isolation is related to reward values in terms of alienation. Isolated people "assign low reward value to goals or beliefs that are typically highly valued in the given society" (Seeman 1959). Self-estrangement refers to the inability of an individual to obtain self-rewarding or self-consummatory activities (Seeman 1959). Dean (Dean 1961), however, considered alienation as having three main components: Powerlessness, Normlessness and Social Isolation. The last component was conceived as part of Durkheim's conception of anomie - "a feeling of separation from the group or of isolation from group standards"

(Dean 1961). A 24-item scale was also constructed by Dean to measure these three components (Dean 1961).

In the study of Ifeagwazi and colleagues (Ifeagwazi, Chukwuorji et al. 2015), emphasis was placed on interpersonal, political and socio-economic domains of perceived alienation. Interpersonal alienation has been associated with social isolation, loneliness and feelings of distrust (Ernst and Cacioppo 1999). The indicators of interpersonal alienation have been reported to include feelings that one's thoughts do not count, feelings of being left out, being taken advantage of, and receiving no help if something happened (Lopez-Calva, Rigolini et al. 2012). Political alienation and socio-economic alienation refer to the perceived estrangement from major objects in political domain and from socio-economic activities respectively (Ifeagwazi, Chukwuorji et al. 2015).

Among the above domains, interpersonal alienation is of most relevance to loneliness. Previous research found that lonely individuals tended to have a poorer mental set such as feelings of alienation (Damsteegt 1992), and indicated a significant correlation between the two constructs (r = 0.50) (Suarez, Fowers et al. 1997). However, existing literature of the relationship between loneliness and alienation is scarce and their association and impact warrant more exploration.

2.8 Conclusion

Loneliness, as a negative emotional state, may not be simply remedied by enlarging a person's social network size due to its relevance to an individual's perceived expectations of social interaction and the maladaptive social cognition. Loneliness, which focuses on the emotional feeling for a person's overall social relations, is the main focus of the thesis, given its high prevalence among mental health service users, its great impact on physical

health and potential effect on mental health, and lack of robust evidence base of its interventions, which were described in Chapter 1.

Loneliness is separate from the other concepts described above, although some dimensions of these concepts could be closely related to loneliness such as subjective social isolation, perceived social support, individual, cognitive social capital, and interpersonal alienation. The multiple meanings of all these concepts, the complicated relationships between one another and the freely interchangeable use of these terms by some researchers all point to the necessity for a conceptual model to make it clear how they differ or overlap. Social isolation and loneliness are often used interchangeably as both conditions are the result of inadequate quality and quantity of an individual's social relationships and may have adverse effect on health. Although loneliness may occur without objective social isolation, loneliness and subjective social isolation often overlap for an individual (Zavaleta, Samuel et al. 2014). A group-based intervention designed to prevent social isolation also benefited loneliness by advancing community knowledge and connecting with other participants and community navigators (Saito, Kai et al. 2012). Social isolation is a good over-arching concept because it encompasses both objective and subjective elements of social relations. It could be a good starting point for developing a comprehensive framework incorporating all the related concepts. Loneliness has complex relationships with other concepts relevant to social relations (e.g. social network and social support), partially overlapping and partially distinct. Therefore it is important to be precise about these relationships and about the potentially pathways some of them might offer for intervening with loneliness. A conceptual and methodological review of a conceptual framework for social isolation, loneliness and related terms and their well-developed measures for use in mental health settings will thereby be provided in Chapter 3.

Chapter 3: Social isolation in mental health: a conceptual and methodological review

3.1 Introduction

There has been a growing realisation among researchers, policy makers and practitioners that social relations play an influential role in mental health and psychological wellbeing (Andersson 1998), and that service users themselves place high importance on them. Feelings of loneliness are greater and social network size is smaller among mental health service users than in the general population (Clinton, Lunney et al. 1998, Borge, Martinsen et al. 1999, Lauder, Sharkey et al. 2004, Palumbo, Volpe et al. 2015). Previous studies have identified an association between loneliness and depression (Cacioppo, Hughes et al. 2006, Luanaigh and Lawlor 2008), suicidal behaviour (Goldsmith, Pellmar et al. 2002), personality disorders (Richman and Sokolove 1992), and psychoses (DeNiro 1995). Among people with severe mental illness, social isolation has been linked to higher levels of delusions (Garety, Kuipers et al. 2001), lack of insight (White, Bebbington et al. 2000), and high hospital usage (Mgutshini 2010). Conversely, people who report greater informal social support have been found more likely to recover from psychotic symptoms (Calsyn and Winter 2002).

In Chapter 2, broad definitions of concepts related to loneliness were provided. This chapter explores more precisely how social isolation, loneliness, and related concepts are used, operationalised and measured in the mental health literature. While social isolation has been linked to loneliness, they are not synonymous concepts (Wenger, Davies et al. 1996, Andersson 1998). These, and related terms, including social networks, confiding relationships, and social support, have multiple, often overlapping, meanings. Due to this lack of clarity, researchers sometimes use these terms loosely and interchangeably

(Valtorta, Kanaan et al. 2016). This review develops a conceptual map based on social isolation initially as its internal characteristics are closely related to loneliness and its multidimensional characteristics can help the conceptual map identify and cover more relevant concepts. After being improved, the conceptual model should situate all the related concepts within it including loneliness. In this review, we focus entirely on social relations as they are experienced at the individual level. A higher order sociological approach looks at how people relate to each other within a society. Concepts including ecological social capital, relating to the quality of social relationships within a community, social exclusion, relating to an enforced lack of participation in main social, cultural, economic and political activities and social inclusion, relating to individuals' access to resources and participation in economic, political and social activity, can be distinguished from concepts which focus on relationships at the individual level, such as social isolation.

Existing reviews have provided an overview of the current conceptual and methodological literature on social exclusion both in general and in mental health context (Morgan, Burns et al. 2007, Wright and Stickley 2013) and social capital in general context (Harpham, Grant et al. 2002, Bhandari and Yasunobu 2009). In their 1988 review, House and colleagues identified the structures and processes through which social relationships influence health (House, Landis et al. 1988, House, Umberson et al. 1988). Since then a literature on social relationships and mental health has emerged, in which explicit reference to an over-arching conceptual frame work is generally not made. The goal in this review is to examine the concepts in use in this literature, the extent to which they can be synthesised into a coherent framework, and the match between this conceptual framework and others applied to examining associations between aspects of health and social relationships. A recently published conceptual review investigated measures of

loneliness, social isolation and social relationships at the individual level, focusing on older adults and cardiovascular disease populations (Valtorta, Kanaan et al. 2016). Our current review adds to this understanding, being the first to review the use and measurement of social isolation and related concepts in the field of mental health.

The aim of this review is to provide a comprehensive framework for social isolation and related concepts, and to identify examples of different measurement tools, highlighting the best established measures in the field of mental health. It can help future researchers decide exactly what they want to measure and how to go about it. This review has other six co-authors (Brynmor Lloyd-Evans, Domenico Giacco, Rebecca Forsyth, Cynthia Nebo, Farhana Mann and Sonia Johnson) when it was published, but I was the lead author, carried out the searches and wrote most of the review.

3.2 Method

3.2.1 Overall approach

Conceptual and methodological reviews differ from systematic reviews of effects. The exact scope and procedures of conceptual reviews is established through the process of conducting the review. We followed Lilford and colleagues' recommendations for conducting methodological reviews(Lilford, Richardson et al. 2001) and used an iterative and consultative process to achieve a clear understanding of social isolation and related concepts. This included: searching widely using a variety of databases and sources; making sure that the review is informed by expert advice, including social science, psychological and medical perspectives; allowing some overlap in the various stages of the review process so that the final scope and findings of the review could be clarified in response to interim findings and feedback.

3.2.2 Literature search

Our iterative search strategy involved: 1) expert consultation to identify relevant terms, conceptual papers, or recommended measures; 2) literature search, data extraction and conceptual map development; 3) expert consultation to validate the conceptual framework. Detailed process is described below:

Expert consultation: First, we consulted a multi-disciplinary group of London experts in social aspects of mental health through presentation and discussion at a meeting to identify relevant terms for our literature search. Second, following initial literature searching, we extracted data which informed the development of a draft conceptual map with several domains to fit all identified relevant concepts. Then, we consulted this same group and also contacted 15 international experts identified through initial literature searching, to present our draft conceptual map, seeking feedback and suggestions. These international experts have relevant subject expertise within and outside of the field of mental health, including sociology, social psychology, social neuroscience, social policy, social and behavioural research, and public health sciences.

Literature search: Using terms suggested by the experts, we searched the Web of Science database on 23rd April 2015 for papers defining social isolation and related terms, or the methods of measurement for these concepts. Web of Science was selected as an inter-disciplinary database covering a wide range of subject areas. Search terms for social isolation and related terms (social isolation OR loneliness OR social network* OR social support OR confiding OR confide OR social contact* OR social relation* OR social capital) were combined with terms for mental disorders (mental OR psychiatr* OR schizo* OR psychosis OR psychotic OR depress* OR mania* OR manic OR bipolar near/5 (disorder or disease or illness) OR anxiety). Time limits for the

initial search were restricted to January 1st 2013- 23rd April 2015 as a high volume of articles was retrieved initially. In order to complete the review and report findings to the funder within a limited time, a comprehensive search across years was not conducted. However, reference lists of studies identified were hand-searched for other relevant studies, without time limit. Wherever a paper retrieved for full-text screening referred to another potentially relevant study, this too was retrieved and screened.

From the initial database search, studies proposing a definition or measure of a concept relating to social isolation, and applying this concept or measure to the field of adult mental health were included. Studies of children under 16 and learning disability/organic disorder populations were excluded. Studies with no explicit definition of social isolation or related concepts, or those not using well-developed measures, e.g. single-item, were excluded. Where concepts/measures used in a mental health context had originally been developed in other fields, the original source was retrieved and reviewed.

3.2.3 Data extraction and synthesis

We extracted information on definitions of social isolation and related terms, and on approaches to its measurement, using an electronic data extraction form developed for this review. Initial screening was conducted by single review authors (JW, BLE, RF, CN, FM), with regular meetings between review authors to address uncertainties about inclusion where necessary and check that a consistent approach to screening was applied.

A non-quantitative approach was adopted to synthesise findings. This comprised three stages:

i) Review authors developed a set of conceptual domains covering all elements within identified existing conceptualisations of social isolation and related terms retrieved.

ii) The validity of this conceptual framework was then assessed referring to existing literature. All included papers from the literature search were cross-referenced with the domains developed, to check whether our conceptual map was sufficiently comprehensive to include all relevant concepts and was not adding additional domains not covered in the literature. (A record of the retrieved concepts we reviewed and how we mapped them to the domains of our conceptual framework is provided in Appendix Tables A1.1-A1.7).

iii) Measures of social isolation and related concepts identified by our literature search were reviewed and best examples of suitable measures for each proposed conceptual domains were identified. Measures with good established psychometric properties, demonstrated applicability, and wide use in mental health settings were prioritised. Initial selection of appropriate measures was undertaken by single review authors (JW, BLE, RF, CN, FM); review authors met to agree the final selection based on above criteria.

Further consultation with experts was conducted to improve and validate the conceptual model and to identify any further relevant literature or concepts not included. We persisted in this process until no new concepts or measurement tools emerged.

3.3 Results

Our electronic database search identified 5437 papers. After full text screening of papers from electronic search and from reference lists and review articles, we included 277 papers discussing concepts relating to social isolation. We also retrieved 425 papers presenting measures of relevant concepts, including 191 original papers developing these measures. Of these, we have reported 16 in our review: those most widely used in the field of mental health, with the best established psychometric properties.

3.3.1 A model of social isolation and related concepts

Our review of conceptual definitions enabled us to generate a conceptual model of social isolation and related terms. Our aim was to develop a set of defined domains that would encompass all the frequently used concepts, avoiding overlap or duplication. We developed and corroborated this model by checking the match of the concepts identified to our model domains, and iteratively consulting experts. We propose five conceptual domains that are comprehensive enough to encompass all elements of current conceptualisations: social network – quantity; social network – structure; social network – quality; appraisal of relationships – emotional; and appraisal of relationships – resources. Table 3.1 summarises how these five domains map on to existing conceptual terms.

Table 3.1: Social isolation and related concepts: Conceptual framework

Established concepts relating to social isolation or loneliness	Domains included in existing concepts relating to social isolation or loneliness					
	Network:			Appraisal of relationships:		Other domains (not directly related to social isolation or loneliness)
	quantity	structure	quality	emotional	resources	
Social isolation	×		×	×	×	
Loneliness				×		
Social support	×	×		×	×	
Social network	×	×	×			
Social capital (individual)				×	×	Ecological social capital Negative social capital
Confiding relationships and related concepts			×			Negative aspects of relationships
Alienation				×		Powerlessness, normlessness

Appendix Tables A1.1-A1.7 provide further information about existing conceptual definitions of social isolation and related terms, and how the components of these definitions map on to our proposed five domains. Definitions of our five conceptual domains are as follows:

Network (Quantity) refers to quantity of social contact; e.g. the number of people in someone's social network, number or frequency of someone's social contacts over a period of time.

Network (Structure) refers to characteristics of social contacts, not involving any appraisal of the quality of the relationship: e.g. network density (how many of the people in someone's social network also know each other), and the characteristics of someone's social contacts (e.g. how many are kin, colleagues, mental health staff or mental health service users).

Network (Quality) refers to the perceived quality of relationships. This domain includes measures of the quality of specific important relationships (e.g. partner, parents). It also includes measures of qualitative information about all someone's individual social contacts (e.g. rating how many of someone's social contacts are friends, how many could be confided in, how many would be missed).

Appraisal of relationships (Emotional) refers to overall appraisal of the perceived adequacy or impact of relationships: e.g. loneliness or emotional social support. This domain does not directly relate to, and is not measured by, the number of or quality of specific individual relationships.

Appraisal of relationships (Resources) refers to perceived overall access to resources from someone's social relationships: e.g. tangible social support.

Our five domains enable three important distinctions to be made:

i) Objective versus perceived qualities of someone's social relationships: The 'Network – size' and 'Network – structure' domains provide quantitative information about the number or structure of social contacts. 'Network-quality' and the two relationship appraisal domains by contrast, relate to qualitative appraisal of relationships or social connectedness.

ii) Individual relationships versus overall social/interpersonal connectedness: The three 'network' domains in our conceptual map relate to the quantity or quality of individual relationships. Information about these individual relationships may be summed to describe social connectedness and relationships overall. The two 'appraisal of relationships' domains relate to subjective evaluation of relationships overall, without direct reference to specific individuals.

iii) Tangible (practical) and intangible (emotional) support from relationships: 'Appraisal of relationship – emotional' refers to perceived companionship, love and emotional support derived from social/inter-personal relationships. 'Appraisal of relationships – resources' refers to instrumental (or tangible) support obtainable from social/interpersonal relationships.

There are elements of existing conceptual terms which are not covered by our proposed five conceptual domains. These were excluded as they do not directly relate to social isolation or related concepts:

i) Negative aspects of relationships: social isolation, loneliness and related concepts are defined by the presence or absence of contact or desired support from relationships, rather than negative aspects of social relationships. However, concepts of relationship quality, including expressed emotion, and some conceptualisations of social capital, also consider the actively negative aspects of interpersonal relationships (such as criticism, or over-involvement),

which require the presence of social contact and may occur independently of loneliness (see Appendix Tables A1.5 and A1.6).

ii) Participation in social, economic or political activity: relevant to social inclusion, social exclusion and included in some conceptualisations of social capital e.g. most conceptualisations of structural social capital (see Appendix Table A1.5).

iii) Degree of trust, perceived shared norms, or beliefs with society or institutions of power: conceptualisations of social capital and alienation both include consideration at societal level of politico-legal and moral norms and requirements and how these are perceived and experienced by individuals (see Appendix Tables A1.5 and A1.7).

Our resulting conceptual map of social isolation and related terms used in mental health research is presented in Figure 3.1.

Figure 3.1: Social isolation and related concepts: Conceptual map
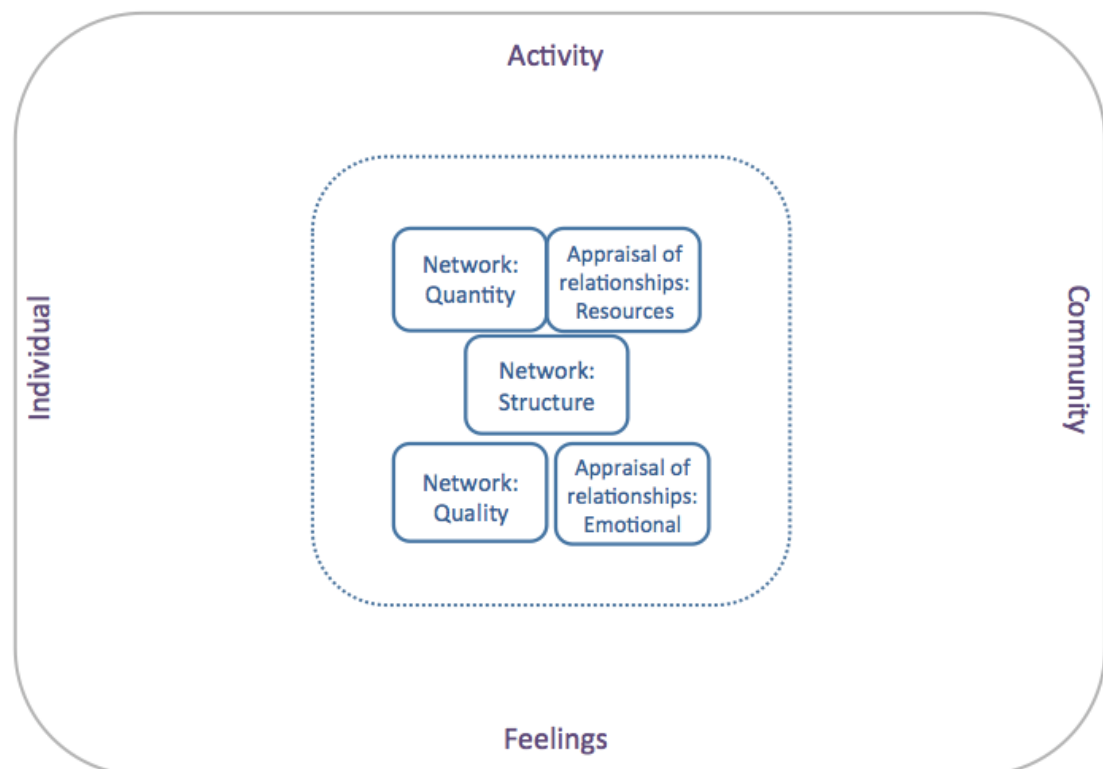
3.3.2 Measures

First, we describe measures suitable for assessing each of our five proposed conceptual domains of social isolation and related terms (Table 3.2). Second, we report multi-domain measures used primarily to provide a total score covering more than one of our identified conceptual domains. In both cases, we follow specified criteria in selecting measures, prioritising those which: 1) have been used widely; 2) have adequate psychometric properties; 3) have been used in an adult mental health context.

i) Social network domains

Two measures most widely used to assess social network domains are the Social Network Schedule (SNS) (Dunn, Odriscoll et al. 1990) and the Network Analysis Profile (NAP) (Sokolovsky and Cohen 1981). The Social Network Schedule (SNS) (Dunn, Odriscoll et al. 1990) was designed to assess the social networks of mental health service users. It generates quantitative data for the number of people in someone's social network; the number of people seen daily, weekly or monthly; the proportion of people in different roles within the network; and the number of people who meet various qualitative criteria, e.g. friends, confidants. The SNS has been used widely and internationally, in both community and inpatient mental health settings (Anderson, Dayson et al. 1993, Becker, Leese et al. 1998, Horan, Subotnik et al. 2006, Albert, Bertelsen et al. 2011, Priebe, Savill et al. 2013, Lloyd-Evans, Sweeney et al. 2015) and has demonstrated good inter-rater reliability (Dunn, Odriscoll et al. 1990) and construct validity (Leff, Odriscoll et al. 1990). Its criterion validity has also been established, with network size and number of confiding relationships associated with quality of life (Becker, Leese et al. 1998), and associated with and predictive of better social functioning (Howard, Leese et al. 2000).

Table 3.2: Suitable measures of conceptual domains of social isolation and related concepts

Domain	Measure	Description
Network: quantity	Social Network Schedule (Dunn, Odriscoll et al. 1990)	*Network size:* the number of people with whom the respondent has had social contact in the last month *Frequency of contact:* the number of people whom the respondent has had social contact daily; weekly; or monthly over the past month
Network: structure	Social Network Schedule (Dunn, Odriscoll et al. 1990)	*Network density:* the proportion of all possible ties between network members which are present (i.e. how many of a respondent's network know each other) *Proportion of kin/non-kin* in social network: How many of the total number of people within a respondent's social network are relatives?
Network: quality	Social Network Schedule (Dunn, Odriscoll et al. 1990)	*Confiding relationships:* the number of social contact people whom the respondent reports they can talk to about worries or feelings *Would be missed:* the number of social contacts respondent would miss if never seen again
Appraisal of relationships: emotional	ULS-8 (Hays and DiMatteo 1987) DeJong-Gierveld Loneliness Scale (de Jong-Gierveld and Kamphuis 1985)	8-item, uni-dimensional scale of *experienced loneliness* 11-item scale of *experienced loneliness*, comprising social and emotional loneliness sub-scales
Appraisal of relationships: resources	Resource Generator-UK (Webber and Huxley 2007)	27-item scale assessing a respondent's *access to resources* within their social network, comprising four sub-scales: domestic resources, expert advice, personal skills, problem-solving resources

Similarly to the SNS, the NAP identifies the attributes of social contacts, the nature of interactions, and characteristics of respondents' networks. However the validity and inter-rater reliability of the NAP are less well established than for the SNS, and it is too lengthy for most routine assessment and research contexts (Siette, Gulea et al. 2015). There is therefore a consensus among the review group that the SNS can be recommended for assessing all three conceptual domains relating to network properties.

Although three of our proposed domains can be measured by the SNS, it is not able to generate summary total score and only separate scores for each measured variable can be reported. Therefore the SNS is different from multi-domain measures described later.

Regarding network quantity, both network *size* (overall number of contacts seen at least monthly); and *frequency* of contacts (number of people seen daily/weekly/monthly) are of interest. For network structure, both network density (number of contacts also in contact with each other) and non-kin relationships are likely to be indicators of access to "weak ties" (Granovetter 1973), which may improve access to resources and information, and recognition of social norms. The number of *confidants* and social contacts who would *be missed* in the SNS have been identified as good indicators of quality of relationships (Leff, Odriscoll et al. 1990), and may be better than measuring number of friends due to the difficulty of maintaining a consistent definition of "a friend" (Harley, Boardman et al. 2012, Palumbo, Volpe et al. 2015).

While the SNS assesses characteristics of all the social contacts in someone's network, an alternative approach used with the general population (Stansfeld and Marmot 1992) and adolescents (Furman and Buhrmester 2009) is to ask respondents to specify and rate the quality of a selected number of their closest relationships. Where such measures can be used to assess any type of

relationship, they are potentially useful to provide an aggregate score relating to network quality. Our review did not find measures validated in mental health settings using this approach, but potentially appropriate, well-established relationship quality measures are described in Appendix Table A2.1.

ii) Appraisal of relationship domains

Emotional appraisal: *Loneliness* measures have been well established and used in mental health settings to assess the overall perceived deficiencies in one's social relationships.

The University of California at Los Angeles (UCLA) Loneliness Scale (version 3) (Russell 1996) is widely used in the general population and clinical research (Russell 1996, VanderWeele, Hawkley et al. 2011, Townley and Kloos 2014). This uni-dimensional, 20-item scale assesses the frequency and intensity of current experience of loneliness (Cramer and Barry 1999). Good internal consistency and test-retest reliability after 12 months have been established, and good construct validity, comprising convergent and discriminant validity and the validity of a uni-dimensional factor structure (Russell 1996). An eight item short-form version has later been developed, which was also reported as reliable and valid (Hays and DiMatteo 1987).

The de Jong-Gierveld Loneliness Scale is another commonly used loneliness measure. From an original 34-item multidimensional scale, (de Jong-Gierveld and Kamphuis 1985), an 11-item scale was developed. This short version is easier to administer and more suitable for lonely and non-lonely respondents (de Jong-Gierveld and Kamphuis 1985). Good psychometric properties have been established (de Jong-Gierveld and Kamphuis 1985, Cramer and Barry 1999, de Jong-Gierveld and van Tilburg 1999). An even shorter six-item version has also been developed for use in large surveys: three items assess

emotional loneliness and three assess social loneliness (de Jong Gierveld and Van Tilburg 2006, de Jong Gierveld and Van Tilburg 2010).

Resource appraisal: Instruments exclusively measuring the perceived ability of social contacts to help with access to resources are few. This domain is often included in broader measures of social support or social capital.

The Resource-Generator UK (RG-UK) (Webber and Huxley 2007) asks about access to 27 types of informational/practical support, generating a total measure of social network resource access. The scale comprises four subscales: domestic resources, expert advice, personal skills, and problem-solving resources. The measure has good validity and reliability (Webber and Huxley 2007), and is feasible for use in mental health settings (Webber, Corker et al. 2014). It is limited by its culturally-specific UK context, and is likely to require future adaptation to ensure validity in different eras or cultural contexts (Webber and Huxley 2007).

iii) Multi-domain measures

Our review also identified numerous measures covering more than one of our proposed conceptual domains. In particular, our review supports Huxley and Webber's observation (Huxley, Evans et al. 2012) that *"measures of social support are as varied as the number of investigators"*. These measures, while often comprised of sub-scales, generate and typically report a total score. Interpreting scores or the meaning of score change is therefore difficult because measures reflect more than one distinct concept. We describe a number of these multi-domain measures in Appendix Table A2.1, prioritising measures most widely used in mental health settings and with demonstrated good psychometric properties.

3.4 Discussion

This review provides an overview of existing definitions of social isolation and related terms and proposes a conceptual model with five domains to include all elements of current conceptualisations: social network - quantity; social network – structure; social network – quality; appraisal of relationships – emotional; and appraisal of relationships – resources. It identifies measures suitable for assessing each of the five conceptual domains or covering multi-domains.

3.4.1 Comparison with other conceptual reviews

House and colleagues (House, Umberson et al. 1988) distinguished two structures of social relationships and support (social integration/isolation and social network structure) and identified three social processes (social support, relational demands and conflicts, and social regulation or control). The domains of "Network: quantity" and "Network: structure" in our conceptual model correspond to the two structure domains in House's framework respectively. House's model is broader in scope than ours as: i) the negative or conflictive aspects of relationships were not covered in our model; and ii) the regulating or controlling quality of relationships was beyond the scope of our model due to the main focus of this domain on societal level rather than individual level relationships. However, House's model did not include a person's emotional response to lack of desired social interaction and thus loneliness cannot be subsumed under any of its categories. Given the increasing research focus on loneliness, a specific domain - "Appraisal of relationships (Emotional)" to cover this concept is important for future research. Additionally, social isolation in House's model only refers to its external characteristics, while subjective social isolation which refers to personal attitudes not quantifiable by observation was not covered.

Valtorta and colleagues' conceptual review of social isolation (Valtorta, Kanaan et al. 2016) looked at literature outside the field of mental health but their findings are highly compatible with ours. The four concepts measured by instruments included in their review (social support, social isolation, social network and loneliness) were included in our review, which also considered measures of social capital, confiding relationships, and alienation. Valtorta and colleagues propose two domains of social relationships: i) objective and structural; and ii) subjective and functional. In our model, the domains of "network quantity" and "network structure" describe objective and structural characteristics of social relationships; while "network quality", and the two "appraisal of relationships" domains in our model describe functional and subjective characteristics.

Compared with the House's and Valtorta's conceptual framework, our model offers two further important conceptual distinctions: i) the characteristics of a person's individual social relationships versus their relationships and inter-personal connectedness overall. For example, an individual who has a poor relationship with parents or partner could have enough supportive friendships, thereby generally not feeling socially isolated; and ii) emotional versus practical elements of the functional characteristics of social relationships. A more specific and explanatory framework is helpful for mental health research because it allows distinction between individual difficulties and societal stigma, and it separates the emotional element, where subjective appraisal may be affected by mental illness symptoms, and the practical element that is less likely to be perceived differently because of psychological difficulties. The compatibility of our conceptualisations with the aforementioned two models, despite the different literatures surveyed, provides a degree of validation for all of them across a range of settings. It provides corroboration

that suggests that our review was sufficiently thorough and in-depth to develop a robust conceptual model.

3.4.2 Strengths and limitations

We sought to ensure the validity of our conceptualisation of social isolation and related terms by following an established, iterative process for conducting conceptual reviews (Lilford, Richardson et al. 2001) and consulting with external experts. Our review provides a model with five domains into which all relevant conceptual terms fit well.

Three limitations relate to the scope of the review. First, we did not include conceptualisations of how people relate to others within the larger social order. Our review synthesised existing conceptualisations of social isolation and related terms at an individual level rather than looking at their societal context.

Second, conceptualisations or measures which have not been used in mental health settings were outside the scope of our review. Concepts and measures potentially relevant to, but not used in, the field of mental health may therefore have been overlooked. The suitability for other population groups of reported measures, which have been used and validated with mental health populations, remains unclear. There are three reasons for focusing on mental health literature in our review: i) Loneliness and social isolation are of increasing interest in mental health, so there is a large, recent literature to draw on. Our a priori assumption has been that the same concepts have been found useful as in other literature, but we wished to establish that this is the case and investigate whether there are any mental health-specific concepts in use; ii) The literature on social isolation and related concepts is too vast and diffuse to review comprehensively across all fields. Valtorta and colleagues (Valtorta, Kanaan et al. 2016) searched relevant literature in the fields of older adults and cardiovascular disease. Our review therefore allows a comparison

with how the concepts are used in mental health; iii) A secondary aim of our review is to identify appropriate measures for use with mental health population for the concepts we propose, which are most easily established through a focus on the mental health literature, allowing identification of measures that have proved feasible and acceptable in this population.

Third, social isolation and related terms have been mainly conceptualised as relating to a lack of relationships or of positive aspects of existing relationships. Our review therefore did not fully explore how negative aspects of relationships have been defined or measured, and we identified few scales measuring negative characteristics of relationships. When people report "low" social support, their score may reflect either the absence of support from others or the presence of a negative, conflictive relationship (Coyne and Bolger 1990), but most social support scales are not able to distinguish these potential meanings of low support (Coyne and Downey 1991). An exception is "the Close Persons Questionnaire" (Stansfeld and Marmot 1992) which includes items on three types of support – confiding/emotional support, practical support and negative aspects of support. Portes (Portes 1998) also proposes the concept of "negative social capital" deriving from peer pressures for exclusive in-group bonding, or high demands from others. Negative aspects of relationships, such as high expressed emotion or interpersonal friction, have been shown to be associated with poor outcomes in schizophrenia and affective disorders (Vaughn and Leff 1976, Coyne and Downey 1991, Stansfeld and Marmot 1992, Zoellner, Foa et al. 1999, Crevier, Marchand et al. 2014). Additionally, some people may keep themselves isolated in order to protect themselves from negative aspects of relationships, so the negative aspects may have a role in explaining the phenomena of social isolation. In short, the conceptualization and measurement of negative aspects of relationships is a fruitful area for a future review.

Two further potential limitations of the review relate to the search strategy and procedures. First, the initial electronic search was only conducted in Web of Science with time limits 2013-2015, although further relevant studies were identified through review articles and through reading full text or reference lists of included studies. Before this process was concluded however, we reached a point where new conceptual definitions of terms or new measures were rarely being identified, suggesting saturation of novel information had been reached. Second, screening of potentially relevant studies was conducted by a team of researchers, with no formal checks of reliability in researchers' selection decisions. To mitigate this, study authors (JW, BLE) provided training for all the researchers involved in literature searching and were consulted in the event of uncertainty about studies' relevance.

3.4.3 Implications for research

The boundaries between social isolation and related terms are often blurred, although they can be conceptually categorized within a relatively small number of domains. This is not solely of academic interest: conceptual clarity can support intervention development and evaluation. A range of interventions may be required to address different problems relating to people's social relationships. Further research is also needed to understand which aspects of people's social relations are most important in sustaining good mental health or recovering from mental illness. In both cases, precision about what exactly is being studied and how best to measure it is essential.

The need for better evidence regarding the effectiveness of social interventions is widely accepted (Oakley 1998, NICE 2014). Our review can contribute to this in the area of social isolation by helping researchers and intervention developers to specify expected outcomes of interventions and mechanisms of effect more precisely, and measure them appropriately. Conceptual clarity can also help researchers explore associations between

social relationships and other outcomes, and directions of effect, more precisely.

Furthermore, our review identified a gap in the literature on social isolation and related concepts regarding: online social relationships. The concepts and measures of social relationships retrieved for our review rarely included consideration of online social contact. People with mental illness may experience greater social isolation and loneliness compared to the general population (Clinton, Lunney et al. 1998, Borge, Martinsen et al. 1999, Garety, Kuipers et al. 2001, Lauder, Sharkey et al. 2004). However, they appear to use social media and online networking similarly to the general population (Ennis, Rose et al. 2012, Firth, Cotter et al. 2016). It may therefore be important to assess online contact when considering social relations in the field of mental health. A systematic review identified limited and primarily qualitative research conducted in this area (Highton-Williamson, Priebe et al. 2015). In studies measuring online social networking, researchers either designed or adapted existing questionnaires (Mittal, Tessner et al. 2007, Spinzy, Nitzan et al. 2012, Martini, Czepielewski et al. 2013), illustrating a lack of validated measure of online social relationships. This lack has hampered comparisons of results across studies (Highton-Williamson, Priebe et al. 2015): development of such a measure would be a useful focus for future research.

In conclusion, our review proposes a conceptual model with five categories which fits all concepts relevant to social isolation. It can help researchers and practitioners to understand and distinguish these concepts, and how they can best be measured in the field of mental health.

Chapter 4: Associations between loneliness and perceived social support and outcomes of mental health problems: a systematic review

4.1 Introduction

In Chapters 2 and 3, I have explored and clarified the terms relevant to social relationships used in mental health. This chapter focuses primarily on loneliness and on perceived social support (a closely related concept), and examines their associations with outcomes of mental health problems. This review had four other co-authors (Farhana Mann, Brynmor Lloyd-Evans, Ruimin Ma, and Sonia Johnson) when it was submitted to a journal, but I was the lead author who carried out the searches and wrote the review.

There is increasing interest in the effects of social relations on health, and in the service delivery and policy implications of such effects (Umberson and Montez 2010). Loneliness has been a particularly prominent focus in recent research on physical health (Uchino 2009, Hawkley and Cacioppo 2010, Petitte, Mallow et al. 2015). For instance, two meta-analytic reviews have reported that loneliness and poor social support are associated with higher mortality rates, and that the effect is comparable with some well-established risk factors such as obesity, physical inactivity, and smoking (Holt-Lunstad, Smith et al. 2010, Holt-Lunstad, Smith et al. 2015). They are also predictive of development of coronary heart disease and stroke (Valtorta, Kanaan et al. 2016), increases in systolic blood pressure (Hawkley, Thisted et al. 2010, Yang, Boen et al. 2015), and chronic pain (Hughes, Jaremka et al. 2014, Jaremka, Andridge et al. 2014) in longitudinal studies. In contrast, while loneliness and lack of social support are well-documented problems among mental health service users (Perese and Wolf 2005), they have not recently been prominent in research, mental health service delivery and policy. To our

knowledge, no systematic synthesis of the evidence on the relationship between loneliness and mental health outcomes has been published.

Loneliness has been defined as a negative emotional state that occurs when there is "a discrepancy between…the desired and achieved patterns of social interaction" (Peplau and Perlman 1982). Psychometrically robust self-report measures of loneliness have been developed and used extensively in research on physical health and on older people, including the University of California at Los Angeles (UCLA) Loneliness Scale (Russell 1996) and the de Jong-Gierveld Loneliness Scale (Dejonggierveld and Kamphuis 1985). Feelings of loneliness are more prevalent among people with mental illness than in the general population (Borge, Martinsen et al. 1999, Lauder, Sharkey et al. 2004). In a study among older adults with major depression, dysthymia, or minor depression, 83% of the respondents reported loneliness and 38% reported severe loneliness (Holvast, Burger et al. 2015). By comparison, only 32% of non-depressed elderly people were lonely and 4% severely lonely using the same loneliness scale (van Tilburg and de Jong Gierveld 1999). In a comparison of people with psychosis and a general population sample with similar demographic characteristics, the prevalence of loneliness among people with psychosis was 79.9% compared with 35% in the general population (Badcock, Shah et al. 2015). For people with depression, cross-sectional studies have found up to 40% of respondents feeling lonely most of the time (Victor and Yang 2012), with a tenfold increase in the odds of being lonely compared to the general population (Meltzer, Bebbington et al. 2013).

Given the high prevalence of loneliness among people with mental health problems and the evidence for its harmful effects in other populations, good quality evidence is needed on its impact on recovery from mental health problems and on the health and social functioning of mental health service

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users. This has potential to inform the development of preventive and therapeutic interventions for which there is not as yet an evidence base. Chapter 3 has explained how far loneliness is conceptually and empirically distinct from other concepts and measures related to social relationships. Loneliness belongs to the conceptual domain of "appraisal of relationships – emotional" and has been shown to be only moderately correlated with more objectively measured concepts such as social isolation, social network size and objective social support received from others (Routasalo, Savikko et al. 2006, Coyle and Dugan 2012). However, subjectively rated concepts related to social relationships are less easy to distinguish clearly from loneliness as they were also included in the domains of "appraisal of relationships" (Wang, Lloyd-Evans et al. 2016). For example, perceived social support refers to people's beliefs about how much support is potentially available from their relationships and social contacts and about the quality of this support (Hupcey 1998, Dour, Wiley et al. 2014). This is distinct from received social support, a rating of how often someone reports receiving particular supportive behaviours (Hupcey 1998, Dour, Wiley et al. 2014). Measures of perceived social support address subjective assessment of social support quality or adequacy. For instance, the two widely used measures, the Multi-dimensional Scale of Perceived Social Support (MSPSS) (Zimet, Dahlem et al. 1988) and the Subjective Support Subscale of Duke Social Support Index (DSSI) (Koenig, Westlund et al. 1993), consist of items such as "How often do you feel lonely", "Can you talk about your deepest problems", "I have friends with whom I can share joys and sorrows", which highly overlap with loneliness measures. Likewise, measures of confiding relationships assess the extent to which people feel close to and able to talk intimately with other people (Brown and Harris 1978, Murphy 1982). Studies have found large negative correlations between loneliness and perceived social support (Lasgaard, Nielsen et al. 2010, Pamukcu and Meydana 2010, Salimi and Bozorgpour 2012, Chrostek,

Grygiel et al. 2016). Thus these concepts resemble loneliness as subjective evaluations of the quality and impact of social relationships: given this conceptual overlap, this paper includes them along with loneliness.

Three previous systematic reviews have explored the relationship between social relations and depression in general population (Santini, Koyanagi et al. 2015, Gariepy, Honkaniemi et al. 2016), or older adults (Schwarzbach, Luppa et al. 2014), but included both cross-sectional and prospective studies. One further review looked at the relationship between social networks and support and early psychosis in people with first episode psychosis and in general population samples, but included no prospective studies (Gayer-Anderson and Morgan 2013). To our knowledge, there is no systematic review which summarises and synthesises the evidence regarding the relationship between loneliness and perceived social support and the course of mental health problems for people with existing mental health conditions, and which includes only prospective studies, from which inferences about the direction of causation may be drawn. Our review will fill this gap, and will provide useful information about the extent and contexts in which loneliness and perceived social support may influence mental health recovery. Thus the aim of the current paper is to synthesise the available evidence as to whether higher levels of loneliness and poorer perceived social support appear to have an adverse effect on outcomes of mental health problems in adults with existing mental illnesses of all ages.

4.2 Method

A systematic review was conducted of the scientific literature addressing the question of whether loneliness and low perceived social support are associated longitudinally with poorer outcomes among adults of all ages with a range of mental health problems. The review's protocol was registered on PROSPERO, which is an international database of prospective systematic

reviews with health related outcomes (registration number: CRD42015014784) (Wang, Mann et al. 2015).

4.2.1 Inclusion criteria

Types of study: The review included longitudinal studies in which the relationship between baseline measures of loneliness and/or poor perceived social support and outcomes at follow up was examined using quantitative measures.

Participants: Participants in the included studies were adults with mental illnesses, specifically schizophrenia and schizoaffective disorder, psychosis in general, depression, bipolar disorder, and anxiety disorders. Clinical populations were included however diagnosis was made, for example clinical diagnoses, ratings according to the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM) or the International Classification of Diseases (ICD), or use of reliable and valid instruments such as the Mini-International Neuropsychiatric Interview (M.I.N.I.). We excluded studies with samples of children under 16 years old, people with intellectual disabilities or organic mental disorders including dementia, or cohorts assembled on the basis of a primary physical illness diagnosis.

Exposure variables: Included studies used quantitative measures of loneliness or of related concepts that involve a subjective rather than objective appraisal of social relationships, such as perceived social support or confiding relationships. Concepts based on objective ratings of the size and functioning of social networks, such as social isolation and social network size, were excluded. Social capital was also excluded as it relates to characteristics of society or communities as a whole as well as individuals' appraisal of their relationships, and is conceptually distinct from loneliness (Wang, Lloyd-Evans et al. 2016). We included studies only if exposure variables assessed

subjective appraisal of overall social connectedness, rather than the quality of specific relationships: therefore, support from partner and quality of a specific significant relationship were excluded.

Outcomes: The review included a wide variety of outcomes, ranging from clinical outcomes to functioning outcomes. Studies in which any of the following outcomes were measured at follow-up were eligible for inclusion:

1) Relapse: recurrent episodes following recovery at baseline of mental illness meeting the criteria of DSM or ICD, or of other reliable and valid instruments such as the Center for Epidemiologic Studies Depression Scale (CES-D), and proxy measures of acute relapse such as admission to psychiatric hospital/crisis services/acute mental health services.

2) Measures of functioning or of recovery: recovery of function, social functioning, self-rated recovery, quality of life, and disability.

3) Symptom severity: level of symptoms, symptom improvement or deterioration.

4) Global outcome: overall outcome rating combining different aspects of mental health and functioning, such as the Health of the Nation Outcome Scales (HoNOS).

4.2.2 Search strategy

A systematic search of the following six electronic databases was undertaken: Medline, PsycINFO, Embase, Web of Science, CINAHL and Cochrane Library (1891 to April 2016). No language and publication period restrictions were applied. Search terms for loneliness and related concepts were combined with terms for mental disorders and outcomes. Searches were conducted using both subject headings (MeSH terms) and text words within title and abstract. Search terms were adapted as required for different databases (for full details, see Appendix Tables A3.1-A3.6). The search terms used in Medline are as follows:

1) Loneliness: loneliness [MeSH] OR loneliness OR lonely OR social support adj5 (subjective or personal or perceived or quality) OR confiding relationship*

2) Mental disorders: mental disorders [MeSH]. exp OR mental OR psychiatr* OR schizo* OR psychosis OR psychotic OR depress* OR mania* OR manic OR bipolar adj5 (disorder or disease or illness) OR anxiety disorders [MeSH]. exp

3) Outcomes: prognosis [MeSH] OR outcome* OR recurren* OR relapse OR admission OR hospitali?ation OR crisis OR admitted OR detained OR detention OR recovery of function [MeSH] OR "social functioning" OR "self-rated recovery" OR "quality of life" OR "symptom severity" OR disability

Reference lists of studies identified through the electronic search for inclusion in the review and of review articles were manually searched for further relevant studies. Relevant studies reported in dissertations, conference reports or other sources other than published journals were searched using the free text and keyword searches from the following two sources: Zetoc (indexing and abstracting database of conference proceedings) and OpenGrey (system for information on grey literature in Europe). When necessary and possible, we sent emails to authors to request full text or clarify some uncertainties.

Selection of studies for inclusion in the review was made independently by two reviewers (J.W. & F.M.). Titles of all identified studies were screened. The abstracts of potentially relevant studies were read; the full text of studies still considered potentially relevant was then retrieved and read. All studies included by one assessor were confirmed by the other reviewer to check adherence to inclusion criteria in study selection. 800 studies excluded by one assessor were checked by the other reviewer to establish reliability of our study selection. The agreement between reviewers was higher than 99%.

Queries about inclusion/exclusion were resolved through discussion with a third reviewer (S.J.).

4.2.3 Data extraction, quality assessment and synthesis

A structured template was developed to extract relevant data from eligible papers. Two review authors (J.W. & F.M.) independently extracted data and assessed their methodological quality. Extracted data and quality assessment scores were checked by a second reviewer for 20% of papers. Disagreements between the two assessors were resolved through discussion with a third review author (S.J.). The methodological quality of each study included in the review was assessed using a standard form adapted from the Mixed Methods Appraisal Tool (MMAT) – Version 2011 (Pluye, Robert et al. 2011). The MMAT has been designed for appraisal of the methodological quality for qualitative, quantitative and mixed methods studies. For quantitative studies it includes criteria relevant to randomised controlled, non-randomised, and descriptive studies. For the purposes of our review, we used the criteria for the quantitative non-randomised domain (Cohort study version). As there are four criteria for this domain following two screening questions, the overall quality score was presented using descriptors *, **, ***, and ****, ranging from * (one criterion met) to **** (all criteria met). The four criteria related to selection bias, measurement quality, adjustment for confounders, and percentage of complete outcome data/response rate/follow-up rate (see Appendix 4). We conducted a narrative synthesis of results as the anticipated heterogeneity of included studies, for example in samples, predictor measures and outcomes, made a meta-analysis inappropriate. The main results have been stratified by type of mental health problem investigated and tables and text were used to summarise the data.

4.3 Results

4.3.1 Literature search

Our initial database search retrieved 13076 records (Figure 4.1). After excluding duplicates and screening titles and abstracts to exclude obviously irrelevant papers, 797 full-text articles were assessed for eligibility. 771 studies were excluded because: i) they were not longitudinal quantitative studies; ii) they were studies about onset of mental health problems in general population; iii) they assessed a form of social relationships conceptually distinct from loneliness or perceived social support; iv) they analysed the relationship between change scores in loneliness and outcome variables, rather than baseline loneliness as a predictor of outcome; or v) they investigated a sample consisting of children under 16 years old or of people with primary diagnoses of drug and alcohol disorders, personality disorders, PTSD, learning disabilities or organic mental disorders, or of people recruited as having specific physical illnesses. Eight further papers were retrieved by hand-searching the reference lists of the papers already identified. Finally, 34 articles about outcomes of mental disorders among people with existing mental health problems were included in this review. The search results are reported as a Prisma diagram in the Figure 4.1.

Figure 4.1: Search strategy

13076 records identified from database searches

    2114 from Medline

    2960 from PsycINFO

    3344 from Embase

    3226 from Web of Science

5179 duplicates removed

7897 records screened

7100 records excluded by titles/abstracts

797 full-text articles assessed for eligibility

771 not eligible because of non-longitudinal quantitative studies, studies about onset of mental health problems in general population, a form of social relationships conceptually distinct from loneliness or perceived social support, change of loneliness not baseline loneliness as a predictor of outcome, a sample consisting of children under 16 years old or of people with primary diagnosis of drug and alcohol disorders, personality disorders, PTSD, learning disabilities, organic

26 eligible papers

8 papers from reference lists

34 studies included about outcomes of mental disorders among people with existing mental health problems

4.3.2 Eligible papers

The 34 eligible papers were from seven countries, including 23 from North America, 10 from Europe and one from Israel. These papers consisted of 23 studies with samples of people with depression, two focusing on schizophrenia or schizoaffective disorders, four on bipolar disorder, and three on anxiety disorders. Two further studies included people with a mixture of mental disorders (Table 4.1). Only two studies directly assessed loneliness, and most of the studies used various scales to measure perceived social support. Nearly half of included papers studied symptom severity as an outcome, a third of the papers assessed recovery/remission, and a third of the papers included other outcomes such as quality of life, disability pension qualification, functional impairment or life satisfaction. The sample sizes of six studies in our review exceeded 400, 22 were between 100 and 400, and six were less than 100. Six studies had short length of follow-up (less than one year), 23 following up the cohorts for one to two years, and five for over two years. With regard to quality assessment, five studies were assigned a maximum score of four (****) as their overall quality scores, 16 studies had a score of three (***) and 13 papers had two (**) according to the appraisal criteria of MMAT. Most studies had lower quality assessment ratings because they didn't report the percentage of complete outcome data, response rate or follow-up rate (for full details, see Appendix Table A5.1).

Table 4.1: Summary of characteristics of included studies

Condition studied	Predictor variable	Outcomes	Sample size range (median)	Length of follow-up*	Follow-up rate range (median)	Quality score
Depression (n=23)	Perceived social support (n=22)	Symptom severity (n=13)	66 – 604 (239)	Short (n=4)	60.6% - 100%	**** (n=4)
	Loneliness (n=1)	Recovery/remission (n=7)		Medium (n=14)	(81·9%)	*** (n=11)
		Functional outcomes (n=5)		Long (n=5)		** (n=8)
Schizophrenia/schizoaffective disorders (n=2)	Perceived social support (n=2)	Functional outcomes (n=2)	139 – 148 (143·5)	Medium (n=2)	71.9% - 100% (86·0%)	*** (n=1) ** (n=1)
Bipolar disorder (n=4)	Perceived social support (n=4)	Symptom severity (n=3)	42 – 173 (55·5)	Short (n=1)	71.1% - 100%	*** (n=2)
		Recovery/remission (n=2)		Medium (n=3)	(86·4%)	** (n=2)
		Functional outcomes (n=2)				
Anxiety disorders (n=3)	Perceived social support (n=3)	Symptom severity (n=1)	134 – 1004 (1004)	Short (n=1)	80% - 87%	**** (n=1)
		Recovery/remission (n=1)		Medium (n=2)	(81·0%)	*** (n=1)
		Functional outcomes (n=1)				** (n=1)
Mixed samples with various mental health problems (n=2)	Perceived social support (n=1)	Symptom severity (n=1)	352 – 743 (547·5)	Medium (n=2)	79.9% - 84.4%	*** (n=1)
	Loneliness (n=1)	Functional outcomes (n=1)			(82·2%)	** (n=1)

* Length of follow-up: Short = <1 year; Medium = 1-2 years; Long = >2 years

4.3.3 Depression

Among the 23 papers with samples of people with depression, 13 studies assessed depression severity as an outcome. Eleven of these found that poorer perceived social support or greater loneliness at baseline was a significant predictor of higher depressive symptom severity at follow-ups (Table 4.2). Nine of these eleven papers conducted multivariable analyses including adjusting for baseline depression severity. In eight of these nine papers, the relationship between baseline loneliness and depressive symptom outcome remained significant. For example, among the three studies with high quality scores (****), Blazer and colleagues (Blazer, Hughes et al. 1992) and Brugha and colleagues (Brugha, Bebbington et al. 1990) followed cohorts of adults with depression in America and the UK respectively. They reported that poorer subjective social support at baseline was predictive of poorer outcomes at follow-up, outcomes including poorer life satisfaction, worse depressive symptoms (Blazer, Hughes et al. 1992), and more severe psychiatric status (Brugha, Bebbington et al. 1990). In the third study rated as high quality, Leskela and colleagues (Leskela, Rytsala et al. 2006) assessed adults with major depressive disorder and found that lower perceived social support six months after initial assessment predicted more severe depression at 18 months among all participants, although this relationship only remained significant in multivariable analysis for the group who had remitted following initial assessment. The only study using loneliness as a predictor of depression outcomes was conducted by Holvast and colleagues (Holvast, Burger et al. 2015) among Dutch older adults. They found that a 1-point higher loneliness score was predictive of a 0.61-point higher depressive symptom severity score at follow-up. Among the 13 studies, three articles had high quality (****), four had medium quality (***), and the other six received low

quality ratings (**). However, no obvious relationship was found between study quality and whether results were significant.

Six out of seven articles which used recovery/remission of depression as their outcomes reported lower perceived social support or higher loneliness at baseline as a significant predictor of lower rates of recovery/remission at follow-up. Three of the seven studies adjusted for baseline depression severity, and all of them reported significant results. For example, in the study of Holvast et al. (Holvast, Burger et al. 2015), the lonely respondents at baseline were reported to be less likely to achieve remission from their depressive disorder at follow-up compared with the non-lonely respondents. Similarly, poorer perceived social support at baseline was a significant predictor of poorer recovery one year later (Bosworth, Hays et al. 2002), and of longer time-to-remission in a study of initially depressed elderly individuals (Bosworth, McQuoid et al. 2002). However, none of the seven studies had high quality scores (****), with five receiving medium (***), and two low scores (**).

With regard to functional outcomes (five articles), three studies have found that lower perceived social support at baseline was a significant predictor of greater likelihood of being granted disability pensions during the follow-up period (Rytsala, Melartin et al. 2007, Holma, Holma et al. 2012) and of more severe functional disability (Rytsala, Melartin et al. 2006). There is also evidence that greater perceived social support predicted better social and work adjustment (Rytsala, Melartin et al. 2006), and buffered functional declines in performance on activities of daily living (Hays, Steffens et al. 2001). However, after adjustment for potential confounders only two (Hays, Steffens et al. 2001, Rytsala, Melartin et al. 2006) of the five studies had significant results.

Table 4.2: Summary of findings on depression

Reference	Predictor variable	Outcome variable		Results (++ <0·05 adjusted; + <0·05 unadjusted; - non-significant)
(Hybels, Pieper et al. 2016)	Perceived social support	Trajectory class (quick recovery, slow recovery, persistent moderate, and persistent high)	++	Patients in the persistent moderate depression class had lower levels of baseline subjective social support compared with patients in the quick recovery class (OR (95%CI)=0.91 (0.83, 0.98)). Patients in the persistent high depression class had lower levels of baseline subjective social support compared with those in the quick recovery class (OR (95%CI)=0.83 (0.75, 0.92))
(Holvast, Burger et al. 2015)	Loneliness	Symptom severity; Remission	++ ++	In the fully adjusted model, a 1-point higher baseline loneliness score predicted a 0.61-point higher depressive symptom severity score at follow-up (Beta=0.61, 95% CI 0.12–1.11, p=0.02). Logistic regression analysis showed that while adjusting for social network size and potential confounders, the very severely lonely respondents were less likely to achieve remission from their depressive disorder compared with the non-lonely respondents (OR=0.25, 95% CI 0.08–0.80, p=0.02).
(Holma, Holma et al. 2012)	Perceived social support	Disability pensions	+	Lower perceived social support at baseline predicted greater likelihood of being granted a disability pension over 5 year follow-up on univariate analysis (P=0.031), but not significant in multivariate analyses where the outcome was the interval time to the date the pension was granted
(Backs-Dermott, Dobson et al. 2010)	Perceived social support	Relapse versus stable remitted	++	Lower perceived social support from a significant other (standardized discriminant function coefficient 0.48) and lower perceived social support from friends (standardized coefficient 0.35) at baseline predicted greater likelihood of depressive relapse at one-year follow-up. The Discriminant Function Analysis was significant, Wilk's Lambda=0.69, x^2 (5)=16.35, p=0.006
(Bosworth, Voils et al. 2008)	Perceived social support	Depression severity	++	Poorer subjective social support was a significant predictor of more severe depression at 12 months. Standardized beta = -0.13, p=0.05
(Rytsala, Melartin et al. 2007)	Perceived social support	Work disability allowances	+	Lower perceived social support at 6 month was a significant predictor of greater likelihood of being granted disability allowances at 18 months (F=6.3, p=0.013), but not significant in multivariate analysis

Reference	Predictor variable	Outcome variable	Results (++ <0·05 adjusted; + <0·05 unadjusted; - non-significant)	
(Continued from previous page)				
(Rytsala, Melartin et al. 2006)	Perceived social support	Functional disability; Social and work adjustment; Days spent ill in bed or not	++ ++ −	Lower perceived social support at baseline was a significant predictor of more severe functional disability at 6 months (B=0.232, β=0.210, p=0.002, 95% CI 0.084 to 0.379), and poorer social and work adjustment at 6 months (B= -0.008, β=-0.222, p=0.001, 95% CI -0.013 to -0.003). Lower perceived social support at 6 months was one of the most significant factors predicting more severe functional disability at 18 months (B=0.240, β=0.215, p=0.002, 95% CI 0.088 to 0.393), and poorer social and work adjustment at 18 months (B=-0.011, β=-0.303, p<0.001, 95% CI -0.015 to -0.006). But perceived social support didn't predict any days spent ill in bed or not
(Leskela, Rytsala et al. 2006)	Perceived social support	Severity of depression	+	Lower perceived social support at 6 months predicted more severe depression at 18 months in original zero-order correlation (r=-0.392, p<0.001) and within-group standardised correlation (r=-0.230, p=0.001) among all patients, but not significant in multivariate analysis. In full remission group at 6 months (n=67), lower perceived social support at 6 months predicted higher level of depressive symptoms at 18 months in multivariate analysis (r=-0.321, p=0.012)
(Steffens, Pieper et al. 2005)	Perceived social support	Severity of depression	++	Lower subjective social support at baseline predicted more severe depression over time (estimate -0.5641, p=0.0002)
(Ezquiaga, Garcia-Lopez et al. 2004)	Perceived social support	Episode remission	−	Higher perceived social support at baseline didn't predict remission at 12 months in univariate analysis (p=0.33), and it wasn't included in multivariate analysis
(Gasto, Navarro et al. 2003)	Perceived social support	Severity of residual symptoms	++	Lower subjective social support at baseline predicted higher intensity of residual symptoms at 9 months in remitters (standardized β=0.41, p<0.001)
(Bosworth, McQuoid et al. 2002)	Perceived social support	Time-to-remission	++	Lower subjective social support at baseline (Hazard Ratio=0.47, 95% CI: 0.31–0.71, p=0.003) was a significant predictor of longer time to remission

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Reference	Predictor variable	Outcome variable		Results (++ <0·05 adjusted; + <0·05 unadjusted; - non-significant)
(Continued from previous page)				
(Bosworth, Hays et al. 2002)	Perceived social support	Remission	++	Lower baseline levels of subjective social support (OR=1.21, 95% CI: 1.09-1.35, p<0.001) predicted poorer recovery one year later
(Triesch 2002)	Perceived social support	Severity of depressive symptoms;	−	Lower perceived social support at baseline didn't predict more severe depression (β=-0.17) or poorer quality of life (β=-0.12) at 3 months
		Quality of life	−	
(Hays, Steffens et al. 2001)	Perceived social support	Activities of daily living	++	There was modest support for hypothesis that baseline subjective social support predicted functional declines at 1 year. There was partial support for hypothesis that the buffering effects of social support against functional decline would be strongest among the most severely depressed patients
(Oxman and Hull 2001)	Perceived social support	Depression severity	++	Greater perceived social support predicted subsequent decreases in depression among participants randomly assigned to placebo group (6-week depression -0.18, p<0.05; 11-week depression -0.22, p<0.05), but not significant among paroxetine group or Problem-Solving Treatment for Primary Care group
(Brummett, Barefoot et al. 2000)	Perceived social support	Depressive symptoms	−	Higher levels of received support at baseline significantly predicted decreases in depressive symptoms at both 6 months and 1 year, whereas subjective support did not significantly predict changes in depressive symptoms at either point in time
(Sherbourne, Hays et al. 1995)	Perceived social support	Number of depressive symptoms	++	Decreased number of depressive symptoms between baseline and 2-year follow-up was predicted by social support at baseline (standardised regression coefficients = 0.12, zero-order Pearson product-moment correlations = 0.16, p < 0.05). Among the subset of patients who had current depressive disorder at baseline, perceived social support was not significantly related to remission. Among patients without current depressive disorder at baseline (subthreshold depression), patients with higher level of perceived social support were less likely to experience a new depressive episode during 2-year period: odds ratio=0.96 (CI:0.95, 0.98)

Reference	Predictor variable	Outcome variable	Results (++ <0·05 adjusted; + <0·05 unadjusted; - non-significant)	
(Continued from previous page)				
(Blazer, Hughes et al. 1992)	Perceived social support	Decreased life satisfaction symptoms; Endogenous symptoms	++ ++	Impaired subjective support at baseline was predictive of poorer outcome at 12-month follow-up in both models: decreased life satisfaction symptoms (b = 0.10, B = 0.37, $p \leq 0.001$), endogenous symptoms (b = 0.10, B = 0.30, $p \leq 0.01$)
(Blazer and Hughes 1991)	Perceived social support	Depressive symptoms	+	Intercorrelation between social support at baseline and depression score at 6 months: -0.41, $p<0.001$. Intercorrelation between social support at baseline and depression score at 12 months: -0.34, $p<0.001$
(Brugha, Bebbington et al. 1990)	Perceived social support	Symptom severity	++	After controlling for the two significant clinical predictors, a significant main effect was found in total sample for lower satisfaction with support at baseline on more severe psychiatric status at 4 months (regression coefficient=-1.46, $p<0.05$)
(George, Blazer et al. 1989)	Perceived social support	Depressive symptoms	++	Impaired subjective social support at baseline is a significant predictor of higher numbers of CES-D symptoms at follow-up (b=8.88, B=0.20, $p\leq0.05$)
(Krantz and Moos 1988)	Perceived social support	Remitted, partially remitted, and nonremitted	+	Lower quality of relationships at baseline predicted poorer remission status after 1 year (χ^2=10.21, $p < 0.01$)

4.3.4 Schizophrenia/schizoaffective disorders

Two studies assessed patients with schizophrenia or schizoaffective disorders to identify psychosocial predictors of health-related quality of life and functional outcomes (Table 4.3). Ritsner and colleagues (Ritsner, Gibel et al. 2006) followed a sample of inpatients with schizophrenia or schizoaffective disorders for 16 months and found that greater perceived support from friends at baseline predicted better satisfaction with life quality after 16 months. In an American study, greater perceived social support was a strong predictor of better scores on a social functioning domain, although it didn't predict the global functioning score (a composite of vocational and social functioning, and independent living) (Brekke, Kay et al. 2005). However, neither of these two studies adjusted for the outcome variable baseline scores.

Table 4.3: Summary of findings on schizophrenia and schizoaffective disorders

Reference	Predictor variable	Outcome variable		Results (++ <0.05 adjusted; + <0.05 unadjusted; - non-significant)
(Ritsner, Gibel et al. 2006)	Perceived social support	Quality of life	++	Higher friend support at baseline predicted better satisfaction with life quality after 16 months (accounted for 2.9% of quality of life index scores at follow up examination)
(Brekke, Kay et al. 2005)	Perceived social support	Global functional outcome (work, social functioning, and independent living);	−	Higher social support did not significantly predict better global functional outcome at 12 months (p<0.10). But social support became a much stronger and statistically significant predictor of social functioning domain
		Social functioning domain	++	

4.3.5 Bipolar disorder

We found four papers that studied adults with a diagnosis of bipolar disorder (Table 4.4). The evidence regarding depressive symptoms was consistent and showed that lower perceived social support predicted greater depression over time (Johnson, Winett et al. 1999, Daniels 2000, Koenders, Giltay et al. 2015). Lower perceived support was also found to be a significant predictor of greater

impairment in functioning (Daniels 2000, Koenders, Giltay et al. 2015), and longer time to recovery (Johnson, Winett et al. 1999). Among remitted patients with prior diagnosis of bipolar I disorder, greater perceived social support reduced risk of recurrence of any type (depressive or manic) at one year (Cohen, Hammen et al. 2004). With regard to severity of manic symptoms, however, the results were not so consistent. In one study lower perceived support significantly predicted more severe manic symptoms on follow-up assessment (Daniels 2000), but in other two studies it was not linked with subsequent manic symptomatology (Johnson, Winett et al. 1999, Koenders, Giltay et al. 2015). Apart from the study of recurrence, there was adjustment for baseline score on the outcome measures for the other three papers.

4.3.6 Anxiety disorders

The three studies of patients with anxiety disorders all reported significant associations between perceived social support at baseline and outcomes at follow-up (Table 4.5). Two studies included people with diagnoses of generalised anxiety disorder, panic disorder, social anxiety disorder or post-traumatic stress disorder. One study found that lower perceived social support was predictive of more severe anxiety and depressive symptoms at subsequent time points (Dour, Wiley et al. 2014), and the other one found that greater amount of perceived social support predicted a higher rate of remission at 6-month follow-up (Jakubovski and Bloch 2016). In a study of older adults with generalised anxiety disorder, Shrestha et al. (Shrestha, Stanley et al. 2015) found that individuals with greater perceived social support at baseline reported greater average quality of life over time, albeit without adjustment for the outcome variable baseline score.

Table 4.4: Summary of findings on bipolar disorder

Reference	Predictor variable	Outcome variable		Results (++ <0.05 adjusted; + <0.05 unadjusted; - non-significant)
(Koenders, Giltay et al. 2015)	Perceived social support	Depressive symptomatology;	++	Lower perceived support predicted more depression related functional impairment during the subsequent 3 months ($β$ (SE)=−0·14 (0.03), p<0.001), and with more depressive symptomatology at the subsequent time point ($β$ (SE)= -0.14 (0.04), p=0.002). No significant associations between perceived social support and manic symptoms and impairment were observed
		Depression related functional impairment;	++	
		Manic symptomatology;	−	
		Manic related functional impairment	−	
(Cohen, Hammen et al. 2004)	Perceived social support	Recurrence	++	After controlling for clinical variables, lower social support of any kind significantly predicted recurrence of any type at one year (β (SE)=-0.09 (0.04), p=0.03, OR=0.92, 95% CI 0.85-0.99)
(Daniels 2000)	Perceived social support	Depressive symptomatology;	++	Lower perceived support was a significant predictor of more severe depressive symptomatology after controlling for initial levels of depression (R^2=0.67, F=34.15, $ΔR^2$=0.05, ΔF=5.24, beta=-0.25). Lower perceived support significantly predicted more severe manic symptomatology over three months (R^2=0.18, F=3.74, $ΔR^2$=0.10, ΔF=4.18, beta=-0.32). Lower perceived social support significantly predicted impairment in functioning in the participants who completed their life charts for 90 consecutive days, after controlling for initial levels of functional impairment (R^2=0.44, F=5.48, $ΔR^2$=0.41, ΔF=10.22, beta=-0.67).
		Manic symptomatology;	++	
		Functional impairment	++	
(Johnson, Winett et al. 1999)	Perceived social support	Time to recovery;	++	Lower social support was a significant predictor of longer time to recovery in Cox regression survival analyses (χ2 (1, N=52) change=5.89, one-tailed p<0.01). In hierarchical multiple regression analyses, low social support predicted higher depression over time (regression coefficient=-1.33, p<0.01, R^2 change=0.07, F change = 11.70). Social support did not have significant impact on mania score at 6-month follow-up
		Severity of depressive symptoms;	++	
		Severity of manic symptoms	−	

Table 4.5: Summary of findings on anxiety disorders

Reference	Predictor variable	Outcome variable	Results (++ <0.05 adjusted; + <0.05 unadjusted; - non-significant)	
(Jakubovski and Bloch 2016)	Perceived social support	Remission; Response (a reduction of at least 40% symptoms at 6 months)	++ ++	Generalised anxiety disorder: Greater amount of social support predicted a higher rate of remission (OR=1.38, 95% CI Wald 1.09-1.75, p=0.0067) and a greater rate of response (OR=1.33, 95% CI Wald 1.10-1.62, p=0.0040) at 6-month follow-up. Social anxiety disorder: Greater amount of social support predicted a higher rate of remission (OR= 1.716, 95% CI Wald 1.028- 2.867, p= 0.0391) at 6-month follow-up, but social support didn't predict response. Social support didn't predict remission or response for panic disorder or post-traumatic stress disorder
(Shrestha, Stanley et al. 2015)	Perceived social support	Quality of life	++	Main effect of social support was significant such that those with higher baseline social support reported higher average quality of life over time (b (SE)=0.41 (0.08), p<0.001)
(Dour, Wiley et al. 2014)	Perceived social support	Anxiety symptoms; Depressive symptoms	++ ++	Direct effects: Relations between perceived social support and depression were bidirectional at all follow-ups, whereas they were unidirectional between perceived social support and anxiety at 6- and 12-month follow-ups. Indirect effects: Intervention led to changes in 6- and/or 12-month perceived social support, that in turn led to subsequent changes in 18-month depression (b= -0.16, CI [-0.28, -0.08], Ratios 10.51%) and anxiety (b= -0.15, CI [-0.30, -0.06], Ratios 8.85%)

4.3.7 Mixed samples with various mental health problems

Two studies examined mixed samples of people with more than one mental disorder (Table 4.6). Beljouw et al. (van Beljouw, Verhaak et al. 2010) analysed data from primary care patients with current anxiety or depressive disorders, and found that greater loneliness at baseline was predictive of more severe depressive or anxiety symptoms at 1-year follow-up. However, after adjustment for baseline severity of depression or anxiety, only the relationship with depression severity remained significant. Fleury and colleagues (Fleury, Grenier et al. 2013) conducted a study among individuals with severe mental health problems including schizophrenia and other psychotic disorders and severe mood disorders. They reported that greater perceived social support was significantly predictive of higher subjective quality of life at 18 months. However, the adjustment didn't include baseline quality of life, although they adjusted for baseline functional ability in the community and diagnosis of schizophrenia.

Table 4.6: Summary of findings on mixed samples with various mental health problems

Reference	Predictor variable	Outcome variable		Results (++ <0.05 adjusted; + <0.05 unadjusted; - non-significant)
(Fleury, Grenier et al. 2013)	Perceived social support	Subjective quality of life	++	Social support variables at baseline accounted for 7.9% of quality of life at 18-month follow-up. Among social support dimensions, higher perception of availability of social integration (β = 0.196, t = 3.472, p = 0.001, 95% CI [0.942, 3.410]) and reassurance of worth supports (β = 0.136, t = 2.397, p = 0.017, 95% CI [0.255, 2.597]) at baseline predicted better quality of life at 18-month follow-up
(van Beljouw, Verhaak et al. 2010)	Loneliness	Severity of depression;	++	A higher symptom severity in depression at 1-year follow-up was predicted by more loneliness at baseline in both multilevel univariate linear regression analyses (β = 0.89, SE = 0.17, p < 0.001) and
		Severity of anxiety	+	multilevel multivariate linear regression analyses (β = 0.39, SE = 0.16, p < 0.05). Positive associations were found between more symptom severity in anxiety at 1-year follow-up and loneliness at baseline by multilevel univariate linear regression analyses (β = 0.40, SE = 0.12, p < 0.01) (but not significant in multivariate analyses)

4.4 Discussion

4.4.1 Main findings

We found 34 studies that reported quantitatively about the longitudinal relationship between perceived social support/loneliness at baseline and various outcomes of mental illness at follow-up. Although substantial heterogeneity exists in the identified articles, some generalisations can be made. There is substantial evidence that less perceived social support at baseline tend to predict higher symptom severity, poorer recovery/remission and functional outcomes at follow-up among people with depression, and preliminary evidence of a similar relationship for people with bipolar disorder, or anxiety disorders. There is also some evidence that greater loneliness is associated with more severe depression and anxiety symptoms and poorer remission from depression. An important consideration in interpreting findings is that depression is very likely to make people more likely to appraise their social support as inadequate and to feel emotionally lonely. However, a persistent effect on outcomes is found in many studies with adjustment for baseline depression severity. With regard to schizophrenia/schizoaffective disorders, only functional outcomes have been studied and the small amount of available evidence suggests that greater perceived social support is predictive of better subjective quality of life and social functioning. This review, to our knowledge, is the first to systematically examine longitudinal studies regarding the relationship between loneliness and closely related concepts and outcomes for adults of all ages and all types of mental illness.

4.4.2 Strengths and limitations of the included studies and of this review

Generally, the quality of included studies is acceptable and most studies were assigned at least *** as their overall quality scores in accordance with the

methodological quality criteria of MMAT. However, some methodological issues in the published literature may limit what can be inferred from the studies. Many studies didn't have comprehensive information about percentage of complete outcome data, baseline response rate, or follow-up rate, resulting in lower quality assessment ratings. Some studies didn't adjust for baseline measurements on the outcomes, leading to increased uncertainty about the direction of causation. A reverse causation is possible (for example, people feel lonely due to depression), or there could well be a circular relationship between exposure and outcome variable. However, a large majority of the 23 studies which did adjust for baseline outcome measures still found loneliness/perceived social support to be predictive of outcomes, which increases confidence in the findings of this review.

The consistency of findings across a variety of settings, measures of the exposure, and population groups increases confidence in the generalisability of the review's findings. The retrieved articles included varying populations including older and younger groups, and people recruited in primary care, inpatient and outpatient settings, and were carried out around the world. Most studies of perceived social support used well-developed scales where psychometric properties have been established. The measures used varied regarding the dimensions and types of social support assessed, although they all measure individuals' subjective appraisal of adequacy or impact of their relationships rather than objective or structural social support. Both loneliness studies used a published measure of loneliness with good established psychometric properties, but this review shows there is still little known about the relationship between loneliness and outcomes of mental health problems. Finally, the studies in our review had sample sizes ranging from 42 to 1004, and diverse follow-up periods from a few months to ten years. The sample size

of most studies is under 400 with less than 100 participants in six articles. However, the consistency of positive findings from included studies, irrespective of their sample size, provides some confidence that studies were not underpowered.

Other limitations of this review relate to the search strategy. Although our literature search was conducted in six databases and a variety of search terms were applied, the search might not be exhaustive. Some relevant studies may have been missed if they didn't use "subjective or personal or perceived or quality" five or fewer words apart from "social support". Some very old papers might not be indexed in electronic databases, and thus cannot be searched. Eligible studies are only from seven countries and most of them were conducted in North America. Very few papers in other languages were retrieved and none of them could be included in our review, although we did search for them and read their abstracts. It is also worth noting that the extent of any reporting bias is uncertain as studies which did not find a positive result might not be published. Another limitation refers to the scope of our review. We restricted the search to the most common mental disorders, including schizophrenia and schizoaffective disorder, psychosis in general, depression, bipolar disorder, and anxiety disorders. The associations between loneliness and perceived social support and other mental health problems need further investigation.

4.4.3 Research implications

Most studies included in our review focused on depression, with other types of mental health problems represented by fewer than five studies each. Nevertheless, some significant relationships have been found between loneliness and/or perceived social support and outcomes of those mental

disorders. Gayer-Anderson and Morgan (Gayer-Anderson and Morgan 2013) systematically examined evidence on social networks and social support in early psychosis. They found some tentative evidence that deficits in social networks and support preceded the onset of psychosis, but it was difficult to disentangle direction of causation as almost all the studies included were cross-sectional and they did not report whether social relationships influence outcomes of psychosis. Given that the prevalence of loneliness in people with psychosis was comparable with that in people with depression, it is surprising that research about impact of loneliness/perceived social support on psychosis is scarce. Similarly, social relationships were shown to be related to bipolar disorder and anxiety disorders, but there is a lack of evidence to discern cause and effect (Teo, Lerrigo et al. 2013, Studart, Bezerra et al. 2015). Therefore more systematic exploration is needed about how loneliness and perceived social support affect conditions such as psychosis, bipolar disorder and anxiety disorders.

Additionally, more longitudinal research with long-term follow-up (and repeated measures) is essential to untangle the direction of effect in the relationship between loneliness/perceived social support and poor outcomes. Among the 34 eligible studies only five articles involve a long-term follow-up period (over 2 years). Thus there is a need to establish the longer term associations of loneliness and perceived social support. As well its effects on longer term mental health outcomes, loneliness may contribute to the adverse physical health outcomes and increased mortality of people with severe mental health problems.

We also found that the relationship between perceived social support and depression was studied far more often and is thus far more clearly established than the relationship between loneliness and depression. Only two studies

retrieved for our review included loneliness as an independent variable for outcomes of mental disorders. They found that loneliness at baseline predicted depression and anxiety severity and remission from depression (van Beljouw, Verhaak et al. 2010, Holvast, Burger et al. 2015). However, the few longitudinal studies of loneliness do not allow definitive conclusions. Therefore more longitudinal research is needed in clinical samples to try to achieve a clear understanding of the impact of loneliness on the course of mental health problems.

4.4.4 Clinical and policy implications

There are a number of clinical and policy implications from the finding that poor perceived social support has a significant impact on outcomes in depression. Firstly, it highlights the need to pay sufficient attention to the social relationships and social support needs of people with mental health problems. Social activities, or thinking about relationships, can be overlooked in clinical consultations – in favour of medications or psychological therapies, and there have been recent calls to raise the profile of social factors in psychiatry as a discipline (Priebe, Burns et al. 2013). Raising practitioners' awareness of the beneficial effects of good perceived social support on symptoms, recovery, and functioning is an important first step, but also promoting awareness amongst service users and the wider public – so that people may feel more motivated to seek relevant help or to try to change their own situation, particularly in depression but probably in other mental health problems studied too.

The development of effective interventions to promote social support and reduce loneliness is required to address the current evidence gap, manifested by the absence of recommendations in this important social domain in current policy guidance. In the UK for example, the National Health Service (NHS)

Five Year Forward View (Zavaleta, Samuel et al. 2014) refers to a series of plans to improve the quality of mental health services and reduce 'burden' on the NHS. Access to psychological therapies, waiting standards and better physical healthcare are highlighted but there is no specific mention of managing the significant problems of loneliness or limited social relationships. International evidence that poor perceived support from social relationships leads to increased service use and poorer outcomes across a range of diagnostic groups should inform future policy in this area. Also in the UK, the latest National Institute for Clinical Excellence (NICE) guidance on illnesses such as depression and schizophrenia, does not recommend social interventions apart from employment support (National Institute for Health and Care Excellence (NICE) (2014, Alvarez-Jimenez, Gleeson et al. 2016).

Clinicians may doubt whether loneliness and limited support from interpersonal relationships are appropriate or feasible as targets for intervention. However, potential interventions are becoming available in a variety of sectors. Around the world, approaches are being developed to try to reduce loneliness among older people in the general population, with potential to be adapted to other groups in the population at risk of adverse effects from poor social support. Mann and colleagues (Mann, Bone et al. 2017) conducted a review of loneliness interventions among people with mental health problems and categorised interventions as 'direct' and 'indirect' approaches. In the UK, a variety of direct approaches to social relationships and social participation are being developed primarily in the charitable sector and in primary care. Social prescribing projects have proliferated in the UK in recent years (Polley, M., M. Dixon, et al. (2016). Social prescribing is not precisely defined, but typically refers to: navigation - the process of linking support for people to access community activities helpful to wellbeing and participation; and/or funding and

providing these activities in a community or group setting (Centre for Reviews and Dissemination (2015). As yet however, social prescribing models are numerous and poorly defined (Polley, M., M. Dixon, et al. (2016), and there is a lack of robust evidence regarding their effectiveness (Centre for Reviews and Dissemination (2015). Psychological approaches, such as Cognitive Behavioural Therapy and Mindfulness, have also been used to help people change their thinking about social relationships: some promising results have been reported, especially with older adult populations (Masi, Chen et al. 2011). Thus there are approaches available with potential to be adapted and tested for people with mental health problems, to try to alleviate the adverse effects identified in this paper. There is also a need to consider public understanding of the importance of nurturing social relationships, as the high prevalence of loneliness is not only an individual but necessarily also a community and societal level problem. Thus people with mental health problems, like other groups in the population who are vulnerable to the effects of loneliness, are likely to benefit from an approach to loneliness that also takes account of community resources and how they might be enhanced (Kearns, Whitley et al. 2015). 'Indirect' broader approaches which do not specifically target loneliness may also have potential impact such as initiatives to promote employment opportunities or housing as these factors may be related to feelings of loneliness (Mann, Bone et al. 2017).

Chapter 5: Peer-provided self-management intervention

Chapters 3 and 4 established that loneliness is a subjectively experienced state which is distinct from objective social isolation; that loneliness is common among people with mental health problems; and that loneliness predicts mental health outcomes. However, the interventions which would be effective for loneliness have not been established yet. The quantitative study of this thesis (methods described in Chapters 6 and 7) will explore the epidemiology of loneliness and its relationship to health outcomes for a sample of Crisis Resolution Team (CRT) users participating in a Randomised Controlled Trial (RCT). The RCT also provided an opportunity to explore the effect of a peer-provided, self-management intervention on loneliness. The reasons why this type of support might be expected to reduce loneliness were briefly discussed in Chapter 1. The methods for evaluating the effect of the intervention on loneliness will be described in Chapters 6 and 7, and the results will be reported in Chapter 10. In this Chapter, the theoretical basis and components of the trial intervention are described, and its potential impact on loneliness is further considered.

The definition and theoretical basis for peer support are described in Section 5.1. The subgroups of peer support are described in Section 5.2. The development of peer support in mental health field is introduced in Section 5.3. The effect of peer support on mental illness and on social relationships is discussed in Section 5.4 and Section 5.5 respectively. The content of peer-provided self-management interventions as a particular form of peer support used in this thesis and its potential mechanism of effect are discussed in Section 5.6.

5.1 What is peer support?

Peer support involves one or more individuals who have experienced mental health problems themselves providing support or services for other mental health service users (Davidson, Chinman et al. 2006). Peer support is not built upon diagnostic system and psychiatric models; on the contrary, it is based on empathic understanding, shared experience, and mutual agreement on what is beneficial (Mead 2003). People tend to feel a connection when they find others are "like" them (Mead 2003). On the basis of this connection, individuals who have faced and suffered mental health problems themselves are able to offer valuable support, encouragement, advice, and an upward social comparison to others in a similar dilemma (Festinger 1954, Davidson, Chinman et al. 2006).

Solomon (Solomon 2004) detailed five theories by which peer support may exert their benefits, including "social support, experiential knowledge, social learning theory, social comparison theory, and helper-therapy principle". Peer delivered services assist with social support which provides both tangible and intangible resources. Peer support workers can offer unique and pragmatic experiential knowledge which may be more specific to an individual's circumstances than information offered by traditional mental health services (Solomon 2004). Social learning theory refers to positive behaviour change and enhanced sense of self-efficacy attributed to credible role models who successfully recovered from mental illness (Solomon 2004). Social comparison theory refers to a sense of hope and optimism provided by peer workers for service users through an upward comparison with their peers who are considered to be healthier than themselves (Solomon 2004). Finally, the benefits peer workers received by effectively helping others are called the helper-therapy principle (Solomon 2004).

5.2 Subgroups of peer support

Although there is a lack of well-defined, generally accepted typology, three major types of formal peer support for people with mental health problems have been described (Davidson, Chinman et al. 1999, Slade 2009). There is a large amount of informal peer support provided between service users, but the focus in this thesis is formal peer support organised and designed as a therapeutic intervention.

i) Mutual support groups

Mutual support was defined as "a process by which persons voluntarily come together to help each other address common problems or shared concerns" (Davidson, Chinman et al. 1999). Mutual support groups are essentially reciprocal and are based on the belief that all peers can contribute in some way, even though some peers may possess more experience or skills than others (Davidson, Chinman et al. 1999, Slade 2009).

The function of mutual support is based on several principles. First, people's understanding of their situation can be improved and social isolation can be decreased by sharing feelings and information with others who have similar experiences (Davidson, Chinman et al. 1999). Second, the "helper therapy principle" plays a part in the process (Riessman 1965, Riessman 1990). People shift their roles from a passive "patient" relying on expert advice to models for newer members, providing feedback and assistance to others, and receiving feedback to address their own problems (Maton 1987, Roberts, Luke et al. 1991). Third, mutual support is a deliberate process which consists of standard routines and instructions on issues in daily life compared to naturally occurring social support (Levine and Perkins 1987, Levy 2000). Fourth, mutual support may work as a cognitive antidote to clients' problems, and help people

learn new ideologies and social cognition to cope with difficulties in their lives (Antze 1976, Levine and Perkins 1987).

ii) Peer support services

Peer support services or consumer-run services are mainly uni-directional, with clearly identified peer workers supporting one or more participants in programmes (Davidson, Chinman et al. 1999). The peer support worker is a role in mental health programmes for which personal experience of mental illness is a job requirement (Slade 2009). But the support is distinguished from or additional to conventional services offered by clinical and rehabilitative settings (Lloyd-Evans, Mayo-Wilson et al. 2014).

Peer support services may encompass comparable roles and expectations of mutual support groups, however they also may be distinguished from mutual support by two major aspects. First, peer support services may not be entirely mutual, because peer support workers are sometimes paid by programmes and may not expect support from participants of programmes (Davidson, Chinman et al. 1999). Second, peer support interactions are more consistent and regular in peer support services than those less formally occurring mutual support groups due to the presence of a more formalised infrastructure and the necessity for more structured activities (Davidson, Chinman et al. 1999).

iii) Peer mental health service providers

Peer mental health service providers who have experienced mental illness themselves are hired by mental health services to offer conventional care (Lloyd-Evans, Mayo-Wilson et al. 2014). The provider is different from standard care rather than the role, so peer mental health service providers are

expected to offer similar services to those offered by clinical staff (Lloyd-Evans, Mayo-Wilson et al. 2014).

Employing peer support workers as staff in traditional clinical and rehabilitative institutions can offer a broader basis to peer support and serve a larger number of mental health service users (Bledsoe Boykin 1997, Mowbray, Moxley et al. 1997). Peer mental health service providers may benefit consumers in many similar ways to mutual support, including offering hope, ideas, and illness self-management skills in an empathic and supportive setting (Davidson, Chinman et al. 1999). However, the peer support is least mutual among the three subgroups, and is restricted by traditional therapeutic boundaries since it is based on the milieu of conventional settings (Davidson, Chinman et al. 1999). Additionally, many mental health professionals have experienced mental health problems without being employed as peer mental health service providers. Hence the boundaries between these professionals and peer workers are blurred and there are debates about whether these staff who have experience of mental health problems should discuss their experience with patients.

5.3 Development of peer support in mental health services

The function of peer support has been accepted for many disorders, for instance addiction, trauma, and cancer; however, the assumption that this function could be adequately and effectively achieved within mental health system has only begun to be seriously considered (Davidson, Chinman et al. 2006). The beginning of the notion can be traced to the early 1990s with programs which employed mental health service users to supply conventional services such as consumer-operated case management (Sherman and Porter 1991, Nikkel, Smith et al. 1992). The efforts of the early "mental health

consumer/survivor movement" contributed to the proliferation of peer support services in mental health system (Davidson, Chinman et al. 2006). Both its political success and the subsequent growth of self-management and mutual support groups showed the potential that individuals who experienced severe mental problems may still play active roles in their own lives and the life of their peers (Davidson, Chinman et al. 2006).

Advocating for access to peer support within mental health system has increased internationally among professional researchers (Deegan 1996, Clay, Schell et al. 2005, Faulkner and Basset 2012) as well as organisations (Group 2009, Bradstreet and Pratt 2010, Halvorson and Whitter 2013). Provision of peer support is increasingly common in recovery-orientated care (Armstrong and Steffen 2009) and in community mental health services (Lloyd-Evans, Mayo-Wilson et al. 2014). In the US, peer support has been approved for Medicaid coverage in 27 states as a special rehabilitation services provider form and an evidence-based mental health care (Services 2017). The Certified Peer Specialist is not a replacement of mental health professionals, but a complement to other mental health support services (Services 2017). In the UK, peer support was scarce within state mental health services before 2010, but over 20 peer support workers are now employed by some NHS Trusts (Repper 2013).

5.4 Effect of peer support on mental illness

Two meta-analyses, one systematic review and one analysis of large sets of trial data have reviewed the evidence of effect of peer support on severe mental illness which refers to the broad definition ("two-dimensional definition: a duration of treatment of two years or more; dysfunction, as measured by the Global Assessment of Functioning scale" (Ruggeri, Leese et al. 2000)).

Lloyd-Evans and colleagues (Lloyd-Evans, Mayo-Wilson et al. 2014) meta-analysed randomised controlled trials of community-based, peer-administered interventions among individuals who experienced severe mental illness - "schizophrenia spectrum or bipolar disorder, or mixed populations using secondary mental health services". In their review, mutual or uni-directional peer support did not have great impact on participants' hospitalisation, overall symptoms or satisfaction outcomes (Lloyd-Evans, Mayo-Wilson et al. 2014). Some positive effects have been found on outcomes of self-rated recovery, hope and empowerment, although they were not accordant within or across various kinds of peer support (Leamy, Bird et al. 2011, Lloyd-Evans, Mayo-Wilson et al. 2014). Trials of mutual support groups found a notable effect on empowerment but not on hope or recovery, whereas trials of peer support services reported benefits for recovery and hope but not for empowerment (Lloyd-Evans, Mayo-Wilson et al. 2014). In another meta-analysis of peer-delivered interventions for severe mental illness, the interventions were classified into superiority trials (peer-delivered intervention in addition to treatment as usual (TAU) versus TAU alone) and equivalence trials (peer-delivered intervention versus the same treatment delivered by professional staff). Peer-delivered interventions had small positive influence on quality of life and hope compared with TAU in superiority trials (Fuhr, Salisbury et al. 2014). On the other hand, the effects of peer-delivered interventions on clinical symptoms and quality of life were comparable to treatment delivered by professional staff in equivalence trials (Fuhr, Salisbury et al. 2014). Similarly, a systematic review found that peer-provided care for severe mental illness led to mental health symptoms, psychosocial and service use outcomes equivalent to those achieved by clinician-provided care (Pitt, Lowe et al. 2013). Davidson et al. (Davidson, Chinman et al. 2006) reviewed data from four randomised controlled trials among adults with serious mental illness, which

identified few differences between the outcomes of conventional care when provided by peers versus non-peers, although peers tended to form effective and steady working alliances with clients in the early stage of treatment process. Despite few positive findings identified in these reviews, they suggested that further exploration and evaluation of peer support interventions should be conducted within high quality programmes (Davidson, Chinman et al. 2006, Pitt, Lowe et al. 2013, Fuhr, Salisbury et al. 2014, Lloyd-Evans, Mayo-Wilson et al. 2014).

In terms of the effect of peer-provided interventions on depression, Pfeiffer et al. (Pfeiffer, Heisler et al. 2011) meta-analysed RCTs that compared a peer support intervention for depression to usual care or a psychotherapy control condition. They found that peer support interventions in addition to usual care were superior to usual care in improving depressive symptoms, and that there was no significant difference between group cognitive behavioral therapy and peer support interventions (Pfeiffer, Heisler et al. 2011). In a meta-analysis of peer-administered interventions' (PAIs) effects on depression symptoms, PAIs performed as well as non-PAIs (such as professionally-administered or electronically-administered) and greatly outperformed no treatment (Bryan and Arkowitz 2015). These findings suggest that peer support interventions could play a significant role in benefiting depressed populations and could improve the quality and availability of care for people who are traditionally underserved (Pfeiffer, Heisler et al. 2011, Bryan and Arkowitz 2015).

5.5 Effect of peer support on social relationships

Walker and Bryant (Walker and Bryant 2013) meta-synthesised findings from qualitative studies about peer support in mental health services. They found that clients who received peer support services reported increased social

networks and more friends with the help of peer support workers (Walker and Bryant 2013). An increase in social networks was also experienced by peer workers themselves through friendship with other peer workers (Walker and Bryant 2013). The results are consistent with a previous longitudinal, qualitative study among people with severe mental health problems in which more active participants receiving four hours or more peer support services reported having more social support at 9 and 18 months compared with nonactive participants receiving less than four hours interventions (Ochocka, Nelson et al. 2006). The active participants also indicated that they had received opportunities to expand their networks and learn social skills (Ochocka, Nelson et al. 2006). This programme also included quantitative studies which verified the qualitative results and showed that active participants improved more on the social support measure at 18 months than nonactive participants (Nelson, Ochocka et al. 2006), and that the continually active participants involved in the programme over three years experienced greater community integration than comparison groups (Nelson, Ochocka et al. 2007).

Shaw and Gant conducted a pre-post study including internet chat sessions in which loneliness and depression were alleviated significantly among undergraduate participants, and perceived social support and self-esteem greatly improved between pre-, mid-, and post-test (Shaw and Gant 2002). However, the finding of the effect of peer support on loneliness was not verified by other randomised controlled trials. These studies consisted of psychosocial group intervention with group activities and mutual support among general, elderly people (Routasalo, Tilvis et al. 2009), a 12-week peer-run group course based on a standardised workbook for participants with major psychiatric disorders (van Gestel-Timmermans, Brouwers et al. 2012), and telephone

based peer support among new mothers around two weeks postpartum with high risk of postnatal depression (Dennis, Hodnett et al. 2009). None of these trials found differences in loneliness between intervention groups and control groups. However, the interventions of the three trials were not similar to the CORE intervention in this thesis which was an individual, face-to-face peer support intervention based on a self-management workbook. Although the participants of van Gestel-Timmermans' study were also a mixed sample with various mental health problems, our sample was a mixed group of secondary mental health service users with relatively severe mental health problems immediately post crisis. They were different from the participants in van Gestel-Timmermans' study who were recruited from mixed health services and were at various levels of recovery. Considering the scarce research of loneliness interventions in people with mental health problems, it is desirable to test whether a peer-delivered programme of support may reduce loneliness for people with mental health problems: the CORE trial provided an opportunity to do this.

5.6 Peer-provided self-management interventions

In recent years there has been a growth in programmes aimed at adopting an illness self-management approach in the management of chronic mental illness (Mueser and Gingerich 2011). These programmes are aimed at developing a collaborative relationship between service users and treatment providers, and generally include learning to expect and respond to signs of a crisis and developing skills to deal with symptoms or other difficulties (Mueser and Gingerich 2011). Mueser et al. (Mueser and Gingerich 2011) listed a common set of goals which were shared by most psychiatric illness self-management programmes, including:

- Infuse individuals with hope for a better quality of life and a more

favourable course towards recovery by improving illness self-management skills

- Develop a collaborative approach between service users and care providers in confirming treatment goals and choosing treatment options

- Offer knowledge about the nature of mental health problems and approaches for treating them

- Instil strategies for supervising the process of the illness and for preventing or minimizing hospitalisations and illness relapses

- Enhance social support for illness self-management

- Provide effective strategies for managing chronic symptoms and illness-related disabilities

- Teach approaches for reducing the negative impacts of stress

- Improve management of mental health problems by helping consumers change their lifestyles

A variety of approaches have been developed to achieve the above goals. Existing illness self-management strategies include "psychoeducation, medication adherence strategies, relapse prevention training, coping strategies for persistent symptoms, stress management, social skills training, family psychoeducation, and peer support" (Mueser and Gingerich 2011). Peer support can be used as a strategy for teaching illness self-management skills and instilling realistic hope for a better quality of life because peer workers are successfully managing their mental health problems and have meaningful lives in different areas (Mueser and Gingerich 2011). The peer-provided self-management interventions fit into the category of peer support services among the aforementioned three subgroups of peer support.

American randomised controlled trials of peer-provided self-management interventions for adults with severe mental illness, such as the Wellness

Recovery Action Planning (WRAP) (Cook, Copeland et al. 2012) and the Recovery Workbook (Barbic, Krupa et al. 2009), suggested their effectiveness in improving outcomes for service users. The WRAP programme assigned participants to an 8-week intervention with 5 to 12 individuals in one class delivered by two peers or a course waiting list control condition (Cook, Copeland et al. 2012). The intervention group reported greater reduction in psychiatric symptoms as well as greater improvement in hopefulness and quality of life over time compared to the control group (Cook, Copeland et al. 2012). In the Recovery Workbook programme, participants in the intervention group received 12 weekly group sessions of Recovery Workbook training conducted by an author of the paper and a peer support worker, whereas the control group received treatment as usual (Barbic, Krupa et al. 2009). Hope, empowerment, and recovery improved more significantly after the training for participants in the intervention group than for those in the control group, but quality of life didn't show a great change (Barbic, Krupa et al. 2009).

In the UK, peer support workers have been increasingly employed by NHS services to provide self-management support for individuals with mental health problems, promoted by initiatives for example the Implementing Recovery through Organisational Change (ImROC) programme (Fleming and Shepherd 2014). Approximately 150 paid peer support workers have been deployed in NHS funded mental health services thanks to ImROC's support (Confederation). Peer workers are acknowledged by the ImROC as an asset to a range of different roles in mental health services, including delivering self-management courses or helping clients complete recovery workbook (Repper 2013). They indicated that peer support workers could benefit service users, peer workers themselves and organisations, and that money might also

be saved via decreased dependence on inpatient care (Confederation , Fleming and Shepherd 2014).

There is reason to hope that peer workers may be well suited to providing self-management interventions effectively because of two conceptual underpinnings: self-efficacy theory (Bandura 1997) and social comparison theory (Festinger 1954). Self-efficacy, the ability of a person to generate desired outcomes and to achieve goals, may be improved through upward social comparison with similar but healthier others, and then the person may produce an incentive and perceived competency to change health behaviours and develop skills towards recovery (Cook, Copeland et al. 2012). Additionally, peer support services may offer a therapeutic relationship with a high degree of empathy which may facilitate good service outcomes (Bryan and Arkowitz 2015). Although professional therapists could be equipped with better cognitive empathy (i.e., the capability to understand a client's mental state, for example their emotions, desires or thoughts), peer workers are more likely to provide greater emotional empathy (i.e., a person's emotional response to others' affective states) (Hassenstab, Dziobek et al. 2007).

Although a limited number of peer support trials have not found significant impact on loneliness, none of them have examined an intervention similar to the CORE one with a comparable client group. It is still a fruitful area and worth more exploration into whether the peer-provided self-management intervention would be beneficial to alleviating loneliness for mental health service users. There are probably two main mechanisms by which our intervention might reduce loneliness: 1) A good relationship with the peer support worker may in itself reduce loneliness and increase participants' confidence or hope in their ability to connect with others; 2) The self-management workbook involves goal-setting. Many participants may well have socially-orientated goals, such

as friends and social activities, family responsibilities, support and help they may need and who they will get it from. Help in achieving these goals may increase their social contact and thus reduce loneliness.

Given the potential benefits of peer-provided self-management interventions to loneliness, and given a dearth of evidence base in this topic, it is worth testing the effect of a peer-provided self-management intervention on loneliness in a high quality randomised controlled trial. A focus on its impact on loneliness can aid the development of recovery-oriented mental health services because severe loneliness could encumber a service user's recovery journey. An exploratory investigation of whether peer-provided self-management intervention makes any difference to loneliness will therefore be provided in Chapter 10, with research questions in Chapter 6 and study methods in Chapter 7.

Chapter 6: Quantitative study: research questions

This study will explore the prevalence and correlates of loneliness in a sample of mental health service users following a mental health crisis which involved use of a Crisis Resolution Team (CRT) service. It will explore possible causal relationships between loneliness and outcomes of mental illness, and understand the efficacy of a peer-provided self-management intervention for loneliness. The study aims and hypotheses are described fully in this chapter.

According to different study questions, research aims can be divided into three parts. Part Ⅰ will look at the epidemiology of loneliness in a cross-sectional study, part Ⅱ will focus on loneliness as predictors of outcomes of mental illness in a longitudinal study, and part Ⅲ will study whether loneliness is alleviated by a peer-provided self-management intervention in a randomised controlled trial (RCT). Chapter 7 will include methods of the quantitative study. The results of each part will be reported in Chapters 8, 9 and 10 respectively. In this chapter, specific aims and hypotheses of each part are described below.

6.1 Part Ⅰ Epidemiology of loneliness in a group of crisis resolution team users

This part addresses two research aims:

a) To assess the severity of loneliness among people leaving Crisis Resolution Teams (CRTs) at the inception of study.

b) To identify factors independently associated with loneliness at baseline among CRT users.

6.2 Part Ⅱ Loneliness as a predictor of outcomes in mental disorders among CRT users: a 4-month prospective study

This part addresses one research question: Does loneliness at baseline predict poor outcomes at 4-month follow-up?

The aim of this part is to determine whether loneliness at baseline can independently predict poor outcomes at 4-month follow-up among CRT users, including overall symptom severity, affective symptoms, self-rated recovery and health-related quality of life.

The following hypotheses will be tested:

1. Greater loneliness at baseline will predict more severe overall symptoms at 4-month follow-up. To test this hypothesis, total score of the Brief Psychiatric Rating Scale (BPRS) at 4-month follow-up and baseline total score of the UCLA Loneliness Scale (ULS-8) will be entered into regression models, adjusting for baseline psychosocial variables (social network size and social capital), socio-demographic variables, psychiatric variables and baseline BPRS total score. Significance will be set at $p < 0.05$.

2. Greater loneliness at baseline will predict more severe affective symptoms at 4-month follow-up. To test this hypothesis, the relationships between affect subscale score from BPRS at 4-month follow-up and baseline ULS-8 total score will be tested in multivariable regression analysis, adjusting for baseline psychosocial variables, socio-demographic variables, psychiatric variables and baseline BPRS affect subscale score. Significance will be set at $p < 0.05$. The affect subscale was chosen as an outcome from the available subscales of the BPRS for separate testing as loneliness has been found to be closely related to depression or depressive symptoms in some previous studies.

3. Greater loneliness at baseline will predict poorer self-rated recovery at 4-month follow-up. To test this hypothesis, total score of the Questionnaire on the Process of Recovery (QPR) and baseline ULS-8 total score will be entered into regression models, adjusting for baseline psychosocial variables, socio-demographic variables, psychiatric variables and baseline QPR total score. Significance will be set at $p < 0.05$.

4. Greater loneliness at baseline will predict poorer health-related quality of life at 4-month follow-up. Linear regression analysis will be used to test this hypothesis, with 4-month follow-up score of the EuroQol Health Questionnaire visual analogue scale (EQ VAS) as dependent variable and baseline ULS-8 total score as independent variable, adjusting for baseline psychosocial variables, socio-demographic variables, psychiatric variables and baseline EQ VAS score. Significance will be set at $p < 0.05$.

6.3 Part Ⅲ The efficacy of peer-provided self-management intervention for loneliness among people leaving crisis resolution teams

This part addresses one research question: Do the feelings of loneliness differ between participants in the peer-provided self-management intervention group and those in the control group?

The primary aim of this part is to examine whether there is any difference in loneliness at 4-month follow-up between participants who were offered the peer-provided self-management intervention and those in the control group who were not.

The following hypothesis will be tested:
Participants in the intervention group will report less loneliness than those in the control group at 4-month follow-up. Linear regression models will be constructed with the follow-up ULS-8 total score as dependent variable and

study allocation (peer support intervention group versus control group) as independent variable. Adjustment will be done for clustering by peer support workers, and for baseline measures of psychosocial variables, socio-demographic variables, psychiatric variables and baseline ULS-8 total score. Significance will be set at $p < 0.05$.

Chapter 7: Quantitative study: methods

7.1 Setting

The sample was taken from patients participating in the Crisis Resolution Teams (CRTs) from six different NHS Trusts: Camden and Islington (Islington), North East London (Waltham Forest), South London and the Maudsley (Southwark & Croydon), West London (Hammersmith & Fulham), Avon and Wiltshire (Bristol), and Surrey and Borders (North East Hampshire & Surrey Heath). These Trusts were selected to include inner city, suburban and more rural regions.

7.2 Participants

All the participants entering the main trial also form the sample for the current study. The participants recruited had received support from a participating CRT team in one of the six Trusts for no less than a week and had ability to provide their written informed consent. Exclusion criteria consisted of:

1) Individuals who presented a high level of risk to other people, if the clinical staff considered that assessment or intervention in a mental health trust might not be safe enough for researchers or peer support workers.
2) Individuals who did not live in the catchment area.
3) Individuals who could not understand English.

The study intended to recruit participants who were comparable to the general population of CRT users. Thus no less than 50% of participants identified at screening from each study Trust needed to have a diagnosis of psychosis or bipolar affective disorder. The intervention was designed to help individuals post-crisis after they were discharged from CRT services. Hence people of no more than one month post-discharge from the CRTs were eligible to participate

in the study. After screening of 3054 service users, 1697 people were eligible for participation. Of these, 401 were recruited and completed baseline interview, a response rate of 23.6%. However, two participants then withdrew their consent for their data to be used and so were excluded, which gave rise to the study sample of 399 participants available for analyses. The flowchart of recruitment is shown in Figure 7.1 below. As we did not have ethics approval to obtain data about the characteristics of people excluded, a comparison between respondents recruited and those who were not was not available in this thesis.

Assessed for eligibility
(n=3054)

Excluded (n=1357):

　Capacity (n=179)

　Risk (n=336)

　Outside area (n=175)

　Language (n=111)

　<7 days with CRT (n=121)

　Hospital discharge (n=146)

　Other (n=289)[a]

Contacted for participation
(n=1697)

Not recruited (n=1298):

　Declined (n=539)

　Unable to contact (n=317)

　Out of time (n=319)[b]

　Other (n=123)[c]

Enrolled and randomized
(n=401)

Allocated to intervention group (n=200)

Received intervention of at least 3 sessions (n=143)

Didn't receive intervention (n=57):

- Declined before 1st meeting　(n=15)
- Unable to contact (n=10)
- Did not attend (n=15)
- Discontinued support after 1 or 2 sessions (n=9)
- Protocol breach (n=3)
- Other (n=5)

Allocated to control group
(n=201)

Follow-up done (n= 156)

Lost to follow-up (n=44)

- Declined (n=11)
- Unable to contact (n=30)
- Other (n=3)[d]

Follow-up done (n= 154)

Lost to follow-up (n=47)

- Declined (n=16)
- Unable to contact (n=26)
- Deceased (n=3)
- Other (n=2)[d]

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Figure 7.1: Participant flow at inclusion and 4-month follow-up

[a] Other = Already taking part/declined/screened; Unable to contact/engage; Amendments to screening process (recruitment of non-psychosis/bipolar participants paused April/May 2015)

[b] Out of time = researcher contact but no definitive response from potential participant within 1 month of CRT discharge

[c] Other = Temporary suspension of recruitment of non-psychosis/bipolar participants; Change in risk/capacity status since screening

[d] Other = Unwell; Risk

7.3 Measures

All the respondents completed a structured baseline assessment. After four months of the baseline assessment, these respondents were asked to complete the measures again except the socio-demographic characteristics.

The primary measure for this thesis, an eight-item short-form measure of the University of California at Los Angeles (UCLA) Loneliness Scale (ULS-8) (Hays and DiMatteo 1987), provided a measure of perceived loneliness. The scale was derived from the 20-item UCLA Loneliness Scale (Russell, Peplau et al. 1980) by Hays and DiMatteo with an internal reliability of 0.84 (Hays and DiMatteo 1987). Both the frequency and intensity of feelings of loneliness in important aspects of life are covered by the unidimensional scale (e.g. "How often do you feel that you lack companionship?"). In order to reduce response bias, the word 'lonely' never appears in the instrument (Cramer and Barry 1999). Items are rated on a 4-point scale: (1) Never, (2) Rarely, (3) Sometimes, and (4) Always, with higher total scores indicating greater loneliness. The UCLA Loneliness scale has been proved to be suitable for both clinical patients and general population (Russell 1996, VanderWeele, Hawkley et al. 2011, Townley and Kloos 2014), and the eight-item short-form measure has solid psychometric properties, with a high level of validity and reliability (Hays and DiMatteo 1987, Wu and Yao 2008, Dogan, Cotok et al. 2011). The de Jong-Gierveld Loneliness Scale is another commonly used loneliness measure with good psychometric properties (Chapter 3). The 11-item

short-form version was developed from the original 34-item scale (de Jong-Gierveld and Kamphuis 1985). The ULS-8 was chosen to measure loneliness for this thesis due to three reasons: 1) The eight-item version is relatively short so it was helpful in reducing participants' response burden; 2) The items of UCLA Loneliness Scale are questions beginning with "How often…". However, the de Jong-Gierveld Loneliness Scale is comprised of declarative statements (e.g. "I often feel rejected", "I find my circle of friends and acquaintances too limited") which might be more negative and sensitive than the ULS-8 items, considering that our participants just experienced mental health crisis; 3) The UCLA Loneliness Scale was reported to be the most widely used loneliness instrument with the highest level of internal consistency among all loneliness scales (Cramer and Barry 1999).

Apart from the ULS-8, baseline interviews also included the measures below:

i. Information of the individual's social and demographic characteristics: date of birth, gender, ethnic background, born in the UK, accommodation and living situation, contact with children, educational attainment, number of psychiatric inpatient hospitalisations, and number of years since first contact with mental health services.

ii. The Social Outcomes Index (SIX) (Priebe, Watzke et al. 2008) – a four-item scale of participants' current circumstances concerning employment, accommodation, and social life (living alone/living with a partnership or family; not meeting a friend within the last week/meeting at least one friend in the last week). The measure offers an overall index of objective social outcomes. The resulting score of SIX ranges from 0 to 6, with higher scores indicating better functioning. As an objective measure, it has practically no measurement error and has been shown to be sensitive to change (Priebe, Katsakou et al. 2011). In this thesis, only the two items of employment and living with a partner or with family were included and they were entered

regression models individually not as a total score. The two items of accommodation and meeting a friend within the last week were excluded because they overlap with the items in measures of socio-demographic characteristics and social network size respectively.

iii. The Lubben Social Network Scale (LSNS-6) (Lubben, Blozik et al. 2006) – a six-item measure of social contact with family and friends. The scale was revised from the original 10-item LSNS by Lubben and Gironda who suggested that the LSNS-6 would be more appropriate than longer instruments as a screener for social isolation in practice settings (Lubben and Gironda 2000, Lubben and Gironda 2003a, Lubben and Gironda 2003b). The total scale score is an equally weighted sum of the six items, with scores ranging from 0 to 30. A clinical cut-point of less than 12 was defined by Lubben et al. for identifying persons deemed at risk for social isolation. The LSNS-6 showed high internal consistency (α = 0.83), stable factor structures, and high correlations with criterion variables (Lubben, Blozik et al. 2006). In this thesis, only items 1 and 4 from LSNS-6 were included: "How many relatives/friends do you see or hear from at least once a month?" These two items provide a measure of objective social isolation. The other four items require subjective appraisal of the participants' relationships with family and friends: they considerably overlap with the loneliness scale and thus were excluded. A total score of the two items (0 – 10) were used in regression analyses, with higher total scores indicating larger social network size.

iv. The Health and Lifestyles Survey Social Capital Questionnaire (Authority 1995) – a six-item measure of neighbourhood social capital regarding enjoyment of living, personal safety, neighbours looking after each other, facilities for children, local transport and leisure facilities. Items are rated on a 3-point scale: (1) Yes, (-1) No, and (0) Don't know. This gives a minimum social capital score of -6 and a maximum of 6, with higher total scores

indicating greater neighbourhood social capital. The responses can be regrouped as follows: Score -6 - 0 Low social capital; Score 1 - 2 Medium social capital; Score 3 - 4 High social capital; Score 5 - 6 Very high social capital.

v. The Brief Psychiatric Rating Scale (BPRS 4.0) (Ventura, Green et al. 1993) – a 24-item scale of psychiatric symptom severity with a structured interview schedule for researchers to rate participants' present condition. The BPRS originally contained 16 symptom categories (Overall and Gorham 1962) and was later expanded to 18 items (Overall, Holliste.Le et al. 1967). Based on the previous versions, Lukoff el al. expanded the BPRS to 24 items (Lukoff, Liberman et al. 1986) and then the BPRS 4.0 offered a more detailed interview guide containing more probe questions for each symptom and better defined anchor points (Ventura, Green et al. 1993). The rater enters a number for each symptom construct that ranges from 1 (not present) to 7 (extremely severe). Thus, possible scores vary from 24 to 168 with lower scores indicating less severe psychopathology. Good to excellent inter-rater reliability of BPRS has been confirmed in existing studies with intraclass coefficients from 0.62 to 0.97 (Bech, Larsen et al. 1988, Tarell and Schulz 1988, Ventura, Green et al. 1993, Roncone, Ventura et al. 1999). Dazzi and colleagues (Dazzi, Shafer et al. 2016) meta-analysed previous factor analyses of the 24-item BPRS and suggested core items for the four primary subscales. In accordance with their suggestions, three subscale scores were derived for analyses in this thesis due to their potential relevance to loneliness, including Affect subscale (anxiety, depression, suicidality, and guilt), Positive symptoms subscale (grandiosity, suspiciousness, hallucinations, and unusual thought content), and Negative symptoms subscale (blunted affect, emotional withdrawal, and motor retardation).

vi. A Questionnaire on the Process of Recovery (QPR) (Neil, Kilbride et al.

2009) – a 22-item measure of self-rated recovery. Factor analyses indicated that the QPR has two subscales, "intrapersonal" and "interpersonal", which were associated with psychological distress, quality of life and empowerment. Each item consists of a declarative statement (e.g. "I feel better about myself") with a five-point Likert scale that ranges from "Disagree strongly" (0), "Disagree" (1), "Neither agree nor disagree" (2), "Agree" (3) to "Agree strongly" (4), with higher scores indicative of recovery. The QPR possesses satisfactory internal consistency (Cronbach's alpha coefficients α=0.94 and α=0.77 for two subscales respectively), construct validity and reliability (test–retest reliability r=0.874 and r=0.769 for two subscales respectively) (Neil, Kilbride et al. 2009).

vii. The Euroqol 5-Dimension Health Questionnaire (EQ-5D) (Rabin and de Charro 2001) – a 5-item scale of health-related quality of life in terms of mobility, self-care, usual activities, pain/discomfort and anxiety/depression, plus a vertical, 0-100-point visual analogue scale (VAS) for rating the overall health status with endpoints of best state set at 100 and worst state set at 0. Each dimension of the 5-item measure is divided into three levels, i.e., no problem/some or moderate problems/extreme problems. The information derived from the 5 dimensions can be converted into a single summary index (EQ-5D$_{index}$) by applying scores from one of the European valuation sets. Patients' descriptions of real health states are thus combined with public preferences for hypothetical health states, in order to take into account societal preferences (Matter-Walstra, Klingbiel et al. 2014). However, the EQ VAS is considered to be a more appropriate measure of the respondents' overall self-rated health status in this thesis than the EQ-5D$_{index}$ as the EQ VAS scores have smaller ceiling effect and wider coverage of health-related quality of life (McCaffrey, Kaambwa et al. 2016). EQ-5D is a psychometrically sound tool (Khanna, Jariwala et al. 2013, Sonntag, Konnopka et al. 2013) and currently is being widely used in

different countries by clinical researchers in a variety of clinical areas (Rabin and de Charro 2001).

In addition to the above measures, the information of current diagnosis at baseline was collected from consenting participants' clinical records.

7.4 Intervention

Participants in the intervention group were offered up to ten meetings by a peer support worker, each lasting about an hour. The peer workers listened to participants with a high degree of empathy and shared their illness self-management strategies and social skills with clients so as to infuse realistic hope towards recovery. The reasons why the intervention might be expected to reduce loneliness were provided in Chapter 5. The assigned peer support workers contacted participants to arrange their first meeting in convenient places as the participants preferred or in NHS premises as advised by clinicians in CRTs. Peer workers normally arranged the meetings once a week at mutually convenient venues and time so as to complete the intervention within three months following baseline interview. Based on participants' agreement, the peer support workers would try to involve the participants' family, friends or mental health staff by inviting them to take part in a meeting or showing them the workbook so as to elicit their support for participants or strengthen their relationships.

All the peer support workers were mental health service users who had suffered from mental illness themselves. Participating NHS Trusts had agreed the approaches to recruitment of peer workers. All of them attended the trainings organised by the research group and those demanded by the NHS Trusts where they were employed. The peer support workers were regularly supervised as a group by clinical staff from participating NHS Trusts and researchers from the study group. An experienced clinician and a peer worker

from the research team arranged extra group supervision or teleconference once a week.

During the intervention, participants were asked to complete a self-management workbook with the help of peer support workers. The workbook involved the following elements:

- Setting short term and long term goals towards recovery
- Assisting with improvement of social support and community functioning following a crisis
- Recognising early signs that a relapse is looming and making plans to avoid or abate a crisis
- Making plans and thinking of resources to keep well after a crisis has relieved

The study researchers adapted the self-management workbook from the Personal Recovery Plan booklet and a guide to use the booklet which were developed by Rachel Perkins and colleagues at South West London and St Georges NHS Foundation Trust (South West London and St George's Mental Health NHS (Trust 2008a, Trust 2008b). Their booklet was based on both the expertise of mental health researchers and the experience of mental health service users (South West London and St George's Mental Health NHS (Trust 2008b).

The self-management workbooks were also sent to participants in the control group, but they did not receive extra guidance on how to use it and were not assigned a peer support worker.

7.5 Procedures

a) Recruitment and consent

Potentially eligible participants were identified by clinicians in CRTs and study researchers. At this stage, clinicians, together with researchers, screened out service users who posed a high level of risk to other people, who lacked ability to provide their written informed consent, who lived outside the catchment area or who did not understand English. Clinicians also helped researchers to verify if the potential participants had psychosis or bipolar affective disorder. After screening, potential participants were contacted by clinical staff in CRTs or other community mental health services to introduce the study and inquire their willingness to be called by study researchers for further discussion. If they were willing to be contacted by researchers, then clinicians transmitted their basic information to researchers including names, contact details, whether meetings should be in NHS premises and so on. During their contact with researchers, they were informed of the content and procedure of the study and given a chance to ask any questions. After receiving their oral consent, researchers sent them an information sheet with more details of the study and arranged an appropriate meeting time and place to obtain written informed consent.

b) Baseline interview

After written consent was received, the study baseline measures were completed with all consenting participants as a structured interview. In accordance with the risk limitations stipulated by clinical staff, baseline interviews were completed at participants' accommodation, coffee shops or other public space, or NHS or university premises. After the assessment, participants were given £20 cash gift in gratitude for their assistance with the study. For those who completed the baseline interview, the study researchers sent a letter and the signed consent form to their GP, manager and psychiatrist of the participating CRT to notify their participation in the study.

c) Randomisation and blinding

After baseline interview, the study data officer or trial manager block randomised consenting participants into intervention and control groups, stratified by site. Randomisation was achieved through "Sealed Envelope" — an independent randomisation service commissioned by the Priment Clinical Trials Unit. Once the "Sealed Envelope" showed the allocated group for a participant, and once the individual was discharged from the CRT, the trial data officer informed the participant of randomisation result and helped arrange a peer support worker to contact the person if he/she was in the intervention group. The data officer would also ask participants in the intervention arm whether or not the same gender were necessary when allocating a peer worker.

Although it was not possible to blind respondents to the group which they were assigned to (intervention group or control group), researchers were not aware of participants' allocation status when arranging follow up interviews, and always reminded participants not to uncover their allocation status. However, it was not possible to ensure blinding was maintained in all cases, as participants might divulge whether or not they had received the peer support during the follow up interview.

d) The follow-up interview

Participants were contacted again by researchers once it had been four months following entry into the study. For all who were willing, written informed consent was obtained from the participant, and then a structured follow-up interview was completed. After the interview, participants were given £20 cash gift in gratitude for their assistance with the study.

Study researchers carried on trying to contact people if couldn't get hold of them initially. There was no cut off when it became too late to do the follow up.

e) Data from patient records

At the end of recruitment, the researchers, contacted administrators or informatics team from the NHS Trust to collect data from patient clinical records.

7.6 Analysis

Analysis plans in compliance with aims and hypotheses in three parts presented in Chapter 6 are described below. All analyses were performed using Stata version 12.1.

Part Ⅰ Epidemiology of loneliness in a group of crisis resolution team users

Aims

This part addresses two research aims:

a) To assess the severity of loneliness among people leaving Crisis Resolution Teams (CRTs) at the inception of study.

b) To identify factors independently associated with loneliness at baseline among CRT users.

Dependent variable

UCLA Loneliness Scale (ULS-8)

Independent variables

a) Socio-demographic variables

- Age (years)
- Gender (0 = Male, 1 = Female)
- Ethnic background (1 = White British, 2 = White Other, 3 = Black/Black British, 4 = Asian/Asian British, 5 = Mixed)
- Born in the UK (0 = No, 1 = Yes)

- Housing (0 = Other, 1 = Independent accommodation)

- Contact with children under 16 (0 = Other, 1 = Living with dependent children)

- Education attainment (1 = No qualifications, 2 = Other qualifications, 3 = Degree)

- Employment (0 = No, 1 = In voluntary, protected or sheltered work, 2 = In regular employment) – 1 item from Social Outcomes Index (SIX)

- Living with a partner or with family (0 = No, 1 = Yes) – 1 item from SIX

b) Psychosocial variables

1) Social network size – item 1 and 4 from Lubben Social Network Scale (LSNS-6): How many relatives/friends do you see or hear from at least once a month?

2) Health and Lifestyles Survey Social Capital Questionnaire (HLSSC)

c) Psychiatric variables

- Number of psychiatric inpatient hospitalisations (0 = Never, 1 = Once, 2 = 2-5 times, 3 = More than 5 times)

- Number of years since first contact with mental health services (0 = Less than 3 months, 1 = 3 months – 1 year, 2 = 1-2 years, 3 = 2-10 years, 4 = More than 10 years)

- Affect subscale scores from Brief Psychiatric Rating Scale (BPRS) including 4 core items: Anxiety, Depression, Suicidality, and Guilt (Dazzi, Shafer et al. 2016)

- Positive symptoms subscale scores from BPRS including 4 core items: Grandiosity, Suspiciousness, Hallucinations, and Unusual thought content (Dazzi, Shafer et al. 2016)

- Negative symptoms subscale scores from BPRS including 3 core items: Blunted affect, Emotional withdrawal, and Motor retardation (Dazzi, Shafer et al. 2016)

- Current diagnosis (1 = Psychosis 2 = Bipolar affective disorder/Manic

episode, 3 = Depressive/Anxiety disorders, 4 = Personality disorders, 5 = Other disorders)

Statistical analyses

a) Initial analyses looked at descriptive statistics for all variables at baseline. Descriptive statistics for continuous variables were mean, standard deviation, median, lower quartile, upper quartile, minimum and maximum. These variables were also plotted to check their distribution. For variables not normally distributed, median and interquartile ranges were reported, otherwise mean and standard deviation were reported. With respect to categorical variables, descriptive statistics were reported as frequency and percentage within each category.

b) A series of univariate linear regression analyses were carried out with baseline loneliness scores as dependent variable and the independent variables separately. As loneliness score was not normally distributed, the residual of the models was checked to see whether the models were good fit. If not, the use of variable transformations would be considered.

c) Three multivariable linear regression models were carried out to examine the association between baseline loneliness scores and the three sets of explanatory variables. Blocks of independent variables with $p < 0.25$ in univariate linear regression were entered into the multivariable regression models in the following order: 1) socio-demographic variables; 2) socio-demographic and psychosocial variables; and 3) socio-demographic, psychosocial and psychiatric variables.

Part Ⅱ Loneliness as a predictor of outcomes in mental disorders among CRT users: a 4-month prospective study

Aim

The aim of this part is to determine whether loneliness at baseline can independently predict poor outcomes at 4-month follow-up among CRT users, including overall symptom severity, affective symptoms, self-rated recovery and health-related quality of life.

Hypotheses

1) Greater loneliness at baseline will predict more severe overall symptoms at 4-month follow-up.

2) Greater loneliness at baseline will predict more severe affective symptoms at 4-month follow-up.

3) Greater loneliness at baseline will predict poorer self-rated recovery at 4-month follow-up.

4) Greater loneliness at baseline will predict poorer health-related quality of life at 4-month follow-up.

Dependent variables

- Hypothesis 1 outcome: Total scores of Brief Psychiatric Rating Scale (BPRS) at 4-month follow-up

- Hypothesis 2 outcome: Affect subscale scores from BPRS at 4-month follow-up including 4 core items: Anxiety, Depression, Suicidality, and Guilt

- Hypothesis 3 outcome: Questionnaire on the Process of Recovery (QPR) at 4-month follow-up

- Hypothesis 4 outcome: EuroQol Health Questionnaire visual analogue scale (EQ VAS) at 4-month follow-up

Statistical analyses

a) Potential bias was assessed by comparing respondents who participated at follow-up with those who did not. Independent sample t-tests (for continuous variables) and chi-square tests (for categorical variables) were

carried out for comparison of baseline variables between the two groups.

b) Descriptive statistics were carried out for dependent variables at follow-up. As they were all continuous, descriptive statistics would be mean, standard deviation, median, lower quartile, upper quartile, minimum and maximum. These variables were also plotted to check their distribution. For variables not normally distributed, median and interquartile ranges were reported, otherwise mean and standard deviation were reported. The four dependent variables at baseline and at follow-up were compared respectively by paired sample t-tests.

c) A series of univariate linear regression analyses were carried out with follow-up BPRS total score, BPRS Affect subscale score, QPR total score, and EQ VAS score as dependent variables and baseline factors as independent variables separately. As dependent scores were not normally distributed, the residual of the models was checked to see whether the models were good fit. If not, the use of variable transformations would be considered.

d) Hypothesis 1 was tested using linear regression, with follow-up BPRS total score as dependent variable and baseline ULS-8 total score as independent variable, adjusting for baseline factors which were associated with both dependent and independent variables in univariate analyses with $p < 0.25$. Four models were estimated:

1) The relationship between follow-up BPRS total score and baseline ULS-8 total score in a univariate model.

2) The relationship between follow-up BPRS total score and baseline ULS-8 total score, adjusting for baseline psychosocial variables: social network size (2 items from LSNS-6) and social capital (HLSSC).

3) The relationship between follow-up BPRS total score and baseline ULS-8 total score, adjusting for baseline psychosocial variables (LSNS and HLSSC), socio-demographic variables (born in the UK, housing,

employment, and living with a partner or with family), and psychiatric variables (number of years since first contact with mental health services and diagnosis).

4) The relationship between follow-up BPRS total score and baseline ULS-8 total score, adjusting for all the variables in model 3, plus baseline BPRS total score.

e) Hypothesis 2 was tested using linear regression, with follow-up BPRS affect subscale score as dependent variable and baseline ULS-8 total score as independent variable, adjusting for baseline factors which were associated with both dependent and independent variables in univariate analyses with $p < 0.25$. Four models were estimated:

1) The relationship between follow-up BPRS affect subscale score and baseline ULS-8 total score in a univariate model.

2) The relationship between follow-up BPRS affect subscale score and baseline ULS-8 total score, adjusting for baseline psychosocial variables: social network size (2 items from LSNS-6) and social capital (HLSSC).

3) The relationship between follow-up BPRS affect subscale score and baseline ULS-8 total score, adjusting for baseline psychosocial variables (LSNS and HLSSC), socio-demographic variables (born in the UK, employment, and living with a partner or with family), and psychiatric variables (number of years since first contact with mental health services and diagnosis).

4) The relationship between follow-up BPRS affect subscale score and baseline ULS-8 total score, adjusting for all the variables in model 3, plus baseline BPRS affect subscale score.

f) Hypothesis 3 was tested using linear regression, with follow-up QPR total score as dependent variable and baseline ULS-8 total score as independent variable, adjusting for baseline factors which were associated

with both dependent and independent variables in univariate analyses with $p < 0.25$. Four models were estimated:

1) The relationship between follow-up QPR total score and baseline ULS-8 total score in a univariate model.

2) The relationship between follow-up QPR total score and baseline ULS-8 total score, adjusting for baseline psychosocial variables: social network size (2 items from LSNS-6) and social capital (HLSSC).

3) The relationship between follow-up QPR total score and baseline ULS-8 total score, adjusting for baseline psychosocial variables (LSNS and HLSSC), socio-demographic variables (born in the UK, employment, and living with a partner or with family), and psychiatric variables (number of years since first contact with mental health services and diagnosis).

4) The relationship between follow-up QPR total score and baseline ULS-8 total score, adjusting for all the variables in model 3, plus baseline QPR total score.

g) Hypothesis 4 was tested using linear regression, with follow-up EQ VAS score as dependent variable and baseline ULS-8 total score as independent variable, adjusting for baseline factors which were associated with both dependent and independent variables in univariate analyses with $p < 0.25$. Four models were estimated:

1) The relationship between follow-up EQ VAS score and baseline ULS-8 total score in a univariate model.

2) The relationship between follow-up EQ VAS score and baseline ULS-8 total score, adjusting for baseline psychosocial variables: social network size (2 items from LSNS-6) and social capital (HLSSC).

3) The relationship between follow-up EQ VAS score and baseline ULS-8 total score, adjusting for baseline psychosocial variables (LSNS and HLSSC), socio-demographic variables (born in the UK, employment,

and living with a partner or with family), and psychiatric variables (number of years since first contact with mental health services and diagnosis).

4) The relationship between follow-up EQ VAS score and baseline ULS-8 total score, adjusting for all the variables in model 3, plus baseline EQ VAS score.

Part Ⅲ The efficacy of peer-provided self-management intervention for loneliness among people leaving crisis resolution teams

Aim

The primary aim of this part is to examine whether there is any difference in loneliness at 4-month follow-up between participants who were offered the peer-provided self-management intervention and those in the control group who were not.

Hypothesis

Participants in the intervention group will report less loneliness than those in the control group at 4-month follow-up.

Outcome

UCLA Loneliness Scale (ULS-8) at 4-month follow-up

Statistical analyses

a) Balance of baseline characteristics between the intervention group and the control group was assessed visually. No statistical tests were carried out because randomisation should make them similar.

b) Descriptive statistics were carried out for loneliness (ULS-8) at follow-up. As it was a continuous variable, descriptive statistics would be mean, standard deviation, median, lower quartile, upper quartile, minimum and

maximum. It was also plotted to check its distribution. If it was not normally distributed, then median and interquartile ranges would be reported, otherwise mean and standard deviation would be reported.

c) A series of univariate linear regression analyses were carried out with follow-up ULS-8 total score as dependent variable and baseline factors as independent variables respectively. As loneliness score was not normally distributed, the residual of the models was checked to see whether the models were good fit. If not, the use of variable transformation would be considered.

d) The hypothesis was tested using linear regression, with follow-up ULS-8 total score as dependent variable and study allocation (peer support intervention group versus control group) as independent variable, adjusting for clustering by peer support workers and adjusting for baseline factors which were associated with dependent variable in univariate analyses with $p < 0.25$. Four models were estimated:

1) The relationship between follow-up ULS-8 total score and study allocation in a linear regression model, adjusting for clustering by peer support workers.

2) The relationship between follow-up ULS-8 total score and study allocation, adjusting for clustering by peer support workers and baseline psychosocial variables: social network size (2 items from LSNS-6) and social capital (HLSSC).

3) The relationship between follow-up ULS-8 total score and study allocation, adjusting for clustering by peer support workers and baseline psychosocial variables (LSNS and HLSSC), socio-demographic variables, and psychiatric variables.

4) The relationship between follow-up ULS-8 total score and study allocation, adjusting for clustering by peer support workers and baseline psychosocial variables (LSNS and HLSSC),

socio-demographic variables, psychiatric variables, and baseline ULS-8 total score.

Missing data

All the data were checked for missing values. As the percentage of missing data was low, case mean substitution was used to replace the missing items with the subject's mean score based upon the items that were present for that subject (Fox-Wasylyshyn and El-Masri 2005). This method was only used for loneliness (ULS-8), BPRS subscales, QPR, and social capital (HLSSC) variables, as this technique is appropriate to measures where all items are indicators of a specific concept or construct (Fox-Wasylyshyn and El-Masri 2005) and the items are parallel and approximately interchangeable (Newman 2014). Roth and colleagues (Roth, Switzer et al. 1999) found that case mean substitution was robust in dealing with item-level missingness when data were missing fewer than 20% of the items regardless of whether data were missing randomly or systematically. Eekhout and colleagues (Eekhout, de Vet et al. 2014) found that case mean substitution did not result in highly biased estimates when less than 25% of item scores and less than 10% of cases were missing. Cases with missing data on a single measure over 25% were removed from analysis.

Chapter 8: Quantitative study results: epidemiology of loneliness in a group of crisis resolution team users

8.1 Sample characteristics

The sample at baseline consisted of 399 participants (40.2% male). The median age of them was 40.0 (IQR 29.9 – 50.0), with the youngest respondent being 18 years of age and the oldest 75. 53.8% of the participants were white British. A large proportion of the sample, 89.7%, had independent accommodation, 46.5% were currently living with a partner or with family, and 16.8% were living with dependent children. In terms of education and employment, 27.4% had a degree, whilst 27.3% were in regular employment. Above one in four participants had a diagnosis of psychosis (27.0%), 16.3% were diagnosed with bipolar affective disorder/manic episode, 35.0% of respondents suffered from depressive/anxiety disorders, 13.3% from personality disorders, and 8.4% from other disorders. Participants with psychosis or bipolar affective disorder accounted for 43.3% of the sample, which was less than 50% as identified at screening. During recruitment, clinicians helped researchers to verify if the potential participants had psychosis or bipolar affective disorder according to their memory and impression of whether they had psychotic or bipolar symptoms, which might be different from participants' primary diagnoses. The characteristics of respondents are described in Table 8.1.

Table 8.1: Socio-demographic, psychosocial and psychiatric characteristics of crisis resolution team users

Characteristic	*N* (%) or mean (SD) or median (IQR)
Age (years)	40.0 (29.9−50.0)
Gender	
Male	160 (40.2%)
Female	238 (59.8%)
Ethnic background	
White British	214 (53.8%)
White Other	40 (10.1%)
Black/Black British	80 (20.1%)
Asian/Asian British	37 (9.3%)
Mixed	27 (6.8%)
Born in the UK	
No	89 (22.7%)
Yes	304 (77.4%)
Housing	
Independent accommodation	357 (89.7%)
Other	41 (10.3%)
Contact with children under 16	
Living with dependent children	67 (16.8%)
Other	332 (83.2%)
Education attainment	
No qualifications	76 (19.1%)
Other qualifications	213 (53.5%)
Degree	109 (27.4%)
Employment	
No	257 (64.4%)
In voluntary, protected or sheltered work	33 (8.3%)
In regular employment	109 (27.3%)
Living with a partner or with family	
No	213 (53.5%)
Yes	185 (46.5%)
Loneliness (8−32)	22 (19−25)
Social network size (0−10)	4.9 (2.3)
Social capital (-6−6)	3 (0−5)
Number of psychiatric inpatient hospitalisations	
Never	148 (37.1%)
Once	86 (21.6%)
2-5 times	102 (25.6%)
More than 5 times	63 (15.8%)

Characteristic	*N* (%) or mean (SD) or median (IQR)
(Continued from previous page)	
Number of years since first contact with mental health	
Less than 3 months	67 (16.8%)
3 months – 1 year	39 (9.8%)
1-2 years	28 (7.0%)
2-10 years	126 (31.7%)
More than 10 years	138 (34.7%)
Affective symptoms (4−28)	12 (8−17)
Positive symptoms (4−28)	5 (4−8)
Negative symptoms (3-21)	4 (3−6)
Diagnosis	
Psychosis	106 (27.0%)
Bipolar affective disorder/Manic episode	64 (16.3%)
Depressive/Anxiety disorders	137 (35.0%)
Personality disorders	52 (13.3%)
Other disorders	33 (8.4%)

Abbreviations: *N* = number of participants; SD = standard deviation; IQR = interquartile range. For instruments (loneliness, social network size, social capital, affective symptoms, positive symptoms, negative symptoms) range of scores is indicated between brackets.

8.2 Severity of loneliness at baseline among people leaving CRTs

Over 70% of participants sometimes or more often felt that they lacked companionship, left out, isolated from others, unhappy being so withdrawn, and that people were around them but not with them. More than 20% of respondents always had these feelings. Among the eight items, items 7 and 8 had the biggest number of participants who always felt that way: 33.1% and 28.6% always felt unhappy being so withdrawn and that people were around them but not with them respectively. The descriptive statistics for ULS-8 items are summarised in Table 8.2. Data about the frequency and intensity of loneliness experiences were summed to provide a total loneliness score from 8 – 32. The mean of the total score was 21.9 (SD = 5.0), but the total score exhibited slightly negative skew. Thus the median score, 22 (IQR 19−25), is reported in Table 8.1.

Table 8.2: Descriptive statistics for ULS-8 items

Item	Never N (%)	Rarely N (%)	Sometimes N (%)	Always N (%)
1. How often do you feel that you lack companionship?	40 (10.0%)	57 (14.3%)	205 (51.4%)	97 (24.3%)
2. How often do you feel that there is no one you can turn to?	60 (15.0%)	66 (16.5%)	195 (48.9%)	78 (19.6%)
3. How often do you feel that you are an outgoing person?	59 (14.8%)	108 (27.1%)	164 (41.1%)	68 (17.0%)
4. How often do you feel left out?	41 (10.3%)	73 (18.3%)	194 (48.6%)	91 (22.8%)
5. How often do you feel isolated from others?	32 (8.0%)	61 (15.3%)	199 (49.9%)	107 (26.8%)
6. How often can you find companionship when you want it?	37 (9.3%)	71 (17.8%)	179 (44.9%)	112 (28.1%)
7. How often do you feel unhappy being so withdrawn?	34 (8.5%)	57 (14.3%)	176 (44.1%)	132 (33.1%)
8. How often do you feel people are around you but not with you?	35 (8.8%)	55 (13.8%)	195 (48.9%)	114 (28.6%)

Abbreviations: ULS-8 = UCLA Loneliness Scale-8; N = number of participants.

8.3 Factors associated with loneliness in people with mental health problems

The results of univariate linear regression analyses for factors associated with baseline loneliness are shown in Table 8.3. Feelings of loneliness were more intense in people for whom it had been 2-10 years (coefficient = 1.58, 95% CI 0.10-3.05, p = 0.04) since first contact with mental health services (with less than 3 months used as a reference category), as well as in those who had more severe affective symptoms (coefficient = 0.45, 95% CI 0.38-0.53, p < 0.001), positive symptoms (coefficient = 0.24, 95% CI 0.12-0.35, p < 0.001) or negative symptoms (coefficient = 0.38, 95% CI 0.17-0.60, p = 0.001), and who had diagnosis of depressive/anxiety disorders (coefficient = 1.97, 95% CI 0.73−3.21, p = 0.002), personality disorders (coefficient = 2.60, 95% CI 0.98−4.23, p = 0.002), or other disorders (coefficient = 1.93, 95% CI 0.01−3.84, p = 0.048) (with psychosis used as a reference category). In the meantime, less loneliness was related to bigger social network size (coefficient = -0.79, 95% CI -1.00 − -0.59, p < 0.001), more social capital (coefficient = -0.52, 95% CI -0.68 − -0.36, p < 0.001), 2-5 times (coefficient = -1.46, 95% CI -2.71 − -0.21, p = 0.02) and more than 5 times (coefficient = -2.13, 95% CI -3.59 − -0.67, p =

0.004) of psychiatric inpatient hospitalisations (with never used as a reference category).

Table 8.3: Results of univariate linear regression analyses for factors associated with baseline loneliness

Variables	Coefficient[a]	95% CI	*p*-Value[b]
Socio-demographic variables			
Age (years)	-0.03	-0.07−0.01	0.11
Gender (0 = Male, 1 = Female)	0.39	-0.62−1.39	0.45
Ethnic background			
White British	reference		
White Other	-0.13	-1.82−1.57	0.88
Black/Black British	-0.44	-1.73−0.85	0.50
Asian/Asian British	0.62	-1.13−2.37	0.49
Mixed	-0.83	-2.84−1.18	0.42
Born in the UK (0 = No, 1 = Yes)	1.13	-0.04−2.31	0.06
Housing (0 = Other, 1 = Independent accommodation)	-1.08	-2.70−0.53	0.19
Contact with children under 16 (0 = Other, 1 = Living with dependent children)	-0.73	-2.05−0.58	0.27
Education attainment			
No qualifications	reference		
Other qualifications	-0.11	-1.42−1.20	0.87
Degree	0.23	-1.23−1.70	0.76
Employment			
No	reference		
In voluntary, protected or sheltered work	-0.25	-2.06−1.56	0.79
In regular employment	-1.00	-2.12−0.12	0.08
Living with a partner or with family (0 = No, 1 = Yes)	-0.94	-1.93−0.04	0.06
Psychosocial variables			
Social network size (2 items from LSNS-6)	-0.79	-1.00 − -0.59	**< 0.001**
Social capital (HLSSC)	-0.52	-0.68 − -0.36	**< 0.001**
Psychiatric variables			
Number of psychiatric inpatient hospitalisations			
Never	reference		
Once	-1.29	-2.60−0.03	0.06
2-5 times	-1.46	-2.71 − -0.21	**0.02**
More than 5 times	-2.13	-3.59 − -0.67	**0.004**
Number of years since first contact with mental health services			
Less than 3 months	reference		
3 months – 1 year	1.37	-0.59−3.34	0.17
1-2 years	1.80	-0.39−4.00	0.11
2-10 years	1.58	0.10−3.05	**0.04**
More than 10 years	1.23	-0.23−2.68	0.10
Affective symptoms (4 items from BPRS)	0.45	0.38−0.53	**< 0.001**
Positive symptoms (4 items from BPRS)	0.24	0.12−0.35	**< 0.001**
Negative symptoms (3 items from BPRS)	0.38	0.17−0.60	**0.001**

Variables	Coefficient[a]	95% CI	p-Value[b]
(Continued from previous page)			
Diagnosis			
Psychosis	reference		
Bipolar affective disorder/Manic episode	-0.85	-2.37−0.67	0.27
Depressive/Anxiety disorders	1.97	0.73−3.21	**0.002**
Personality disorders	2.60	0.98−4.23	**0.002**
Other disorders	1.93	0.01−3.84	**0.048**

Abbreviations: CI = Confidence Interval; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; BPRS = Brief Psychiatric Rating Scale.

[a] Negative regression coefficient = less loneliness

[b] Significant p-values printed in bold.

Table 8.4 presents the results of multivariable linear regression analyses for factors associated with baseline loneliness.

Model 1, including socio-demographic variables, explained 2.0% of the variance in loneliness. The factors significantly associated with greater loneliness were younger age (coefficient = -0.04, 95% CI -0.08 — -0.001, p = 0.045).

After adding psychosocial variables to socio-demographics in model 2, the amount of variance explained rose to 18.1%. In this model, greater loneliness was related to younger age (coefficient = -0.05, 95% CI -0.09 — -0.02, p = 0.01), born in the UK (coefficient = 1.12, 95% CI 0.03—2.22, p = 0.045), smaller social network size (coefficient = -0.71, 95% CI -0.93 — -0.50, p < 0.001), and less social capital (coefficient = -0.37, 95% CI -0.53 — -0.20, p < 0.001).

Model 3, where all the three blocks of independent variables were entered into the regression equation, explained a total of 36.2% of the variation in loneliness. In this final model, more intense feelings of loneliness proved to be significantly associated with 2-10 years (coefficient = 1.83, 95% CI 0.49—3.16,

p = 0.01) and more than 10 years (coefficient = 1.19, 95% CI 0.46—3.36, *p* = 0.01) since first contact with mental health services (with less than 3 months used as a reference category), and more severe affective symptoms (coefficient = 0.32, 95% CI 0.23—0.40, *p* < 0.001), whereas less loneliness was associated with bigger social network size (coefficient = -0.56, 95% CI -0.76 — -0.36, *p* < 0.001), greater social capital (coefficient = -0.16, 95% CI -0.31 — -0.003, *p* = 0.046), and more than 5 times (coefficient = -1.82, 95% CI -3.38 — -0.26, *p* = 0.02) of psychiatric inpatient hospitalisations (with never used as a reference category). After adjusting for psychiatric factors, the relations of loneliness with age and born in the UK were no longer significant.

Taken as a whole, the severity of loneliness was high in this sample. In the final multivariable model, factors associated with loneliness in people with mental health problems included number of years since first contact with mental health services, affective symptoms, social network size, social capital, and number of psychiatric inpatient hospitalisations. Findings about the epidemiology of loneliness are discussed in Section 11.1 Part Ⅰ.

Table 8.4: Results of multivariable linear regression analyses for factors associated with baseline loneliness[a]

Variables	Model 1			Model 2			Model 3		
	Coefficient[b]	95% CI	*p*-Value[c]	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
Socio-demographic variables									
Age (years)	-0.04	-0.08 — -0.001	**0.045**	-0.05	-0.09 — -0.02	**0.01**	-0.03	-0.06—0.01	0.17
Born in the UK (0 = No, 1 = Yes)	0.98	-0.21—2.16	0.11	1.12	0.03—2.22	**0.045**	1.00	-0.02—2.02	0.05
Housing (0 = Other, 1 = Independent accommodation)	-0.56	-2.21—1.09	0.51	0.12	-1.42—1.66	0.88	0.45	-1.00—1.90	0.54
Employment									
No	reference								
In voluntary, protected or sheltered work	-0.32	-2.16—1.52	0.73	0.23	-1.45—1.90	0.79	0.66	-0.85—2.17	0.39
In regular employment	-1.00	-2.15—0.15	0.09	-0.04	-1.11—1.03	0.94	-0.16	-1.19—0.87	0.76
Living with a partner or with family (0 = No, 1 = Yes)	-0.87	-1.89—0.15	0.10	-0.36	-1.30—0.58	0.46	-0.47	-1.37—0.42	0.30
Psychosocial variables									
Social network size (2 items from LSNS-6)				-0.71	-0.93 — -0.50	**< 0.001**	-0.56	-0.76 — -0.36	**< 0.001**
Social capital (HLSSC)				-0.37	-0.53 — -0.20	**< 0.001**	-0.16	-0.31 — -0.003	**0.046**
Psychiatric variables									
Number of psychiatric inpatient hospitalisations									
Never							reference		
Once							-0.97	-2.09—0.16	0.09
2-5 times							-1.21	-2.49—0.06	0.06
More than 5 times							-1.82	-3.38 — -0.26	**0.02**

Variables	Model 1			Model 2			Model 3		
	Coefficient[b]	95% CI	p-Value[c]	Coefficient	95% CI	p-Value	Coefficient	95% CI	p-Value
(Continued from previous page)									
Number of years since first contact with mental health services									
Less than 3 months							reference		
3 months – 1 year							1.39	-0.30—3.09	0.11
1-2 years							1.91	-0.01—3.82	0.05
2-10 years							1.83	0.49—3.16	**0.01**
More than 10 years							1.91	0.46—3.36	**0.01**
Affective symptoms (4 items from BPRS)							0.32	0.23—0.40	**< 0.001**
Positive symptoms (4 items from BPRS)							0.10	-0.01—0.21	0.07
Negative symptoms (3 items from BPRS)							0.18	-0.02—0.38	0.07
Diagnosis									
Psychosis							reference		
Bipolar affective disorder/Manic episode							-0.60	-2.00—0.80	0.40
Depressive/Anxiety disorders							0.95	-0.39—2.29	0.17
Personality disorders							-0.01	-1.47—1.46	0.99
Other disorders							0.39	-1.41—2.18	0.67
R^2_{adj}	0.020			0.181			0.362		

Abbreviations: CI = Confidence Interval; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; BPRS = Brief Psychiatric Rating Scale; R^2_{adj} = adjusted-R^2.

[a] Using multivariable linear regression analyses with loneliness score at baseline as dependent variable and factors with $p < 0.25$ in univariate linear regression as independent variables.

[b] Negative regression coefficient = less loneliness.

[c] Significant p-values printed in bold.

Chapter 9: Quantitative study results: loneliness as a predictor of outcomes in mental disorders among CRT users: a 4-month prospective study

9.1 Lost to follow-up

Compared to baseline assessment, 22.3% (N = 89) of the respondents were lost to attrition at 4-month follow-up, resulting in 310 (77.7%) respondents at baseline completing the follow-up measurement. Compared to non-completers, completers were more likely to have independent accommodation (p = 0.01), and to have regular employment or voluntary, protected or sheltered work (p = 0.01). However, no other measures showed statistically significant differences between the two groups. A comparison of baseline variables between respondents who participated at follow-up and those who did not is given in Table 9.1.

Table 9.1: Comparison of baseline variables between respondents who participated at follow-up and those who did not

Characteristic	Completers		Non-completers		p-Value[a]
	M ± SD/%	N	M ± SD/%	N	
Age (M±SD)	40.2 ± 12.8	309	40.3 ± 13.4	89	0.95
Gender (%)					
Male	39.0	121	44.3	39	0.37
Female	61.0	189	55.7	49	
Ethnic background (%)					
White British	53.1	164	56.2	50	0.64
White Other	11.0	34	6.7	6	
Black/Black British	19.1	59	23.6	21	
Asian/Asian British	9.7	30	7.9	7	
Mixed	7.1	22	5.6	5	
Born in the UK (%)					
No	23.6	72	19.3	17	0.40
Yes	76.4	233	80.7	71	
Housing (%)					
Independent accommodation	91.9	284	82.0	73	**0.01**
Other	8.1	25	18.0	16	

Characteristic	Completers		Non-completers		p-Value[a]
	M ± SD/%	N	M ± SD/%	N	
(Continued from previous page)					
Contact with children under 16 (%)					
Living with dependent children	16.5	51	18.0	16	0.73
Other	83.6	259	82.0	73	
Education attainment (%)					
No qualifications	17.5	54	24.7	22	0.18
Other qualifications	53.4	165	53.9	48	
Degree	29.1	90	21.4	19	
Employment (%)					
No	60.3	187	78.7	70	**0.01**
In voluntary, protected or sheltered work	9.0	28	5.6	5	
In regular employment	30.7	95	15.7	14	
Living with a partner or with family (%)					
No	55.7	172	46.1	41	0.11
Yes	44.3	137	53.9	48	
Loneliness (M ± SD; range 8−32)	21.9 ± 4.9	310	21.7 ± 5.4	89	0.68
Social network size (M ± SD; range 0−10)	4.9 ± 2.3	310	4.8 ± 2.2	89	0.55
Social capital (M ± SD; range -6−6)	2.6 ± 2.8	308	2.2 ± 3.4	88	0.28
Number of psychiatric inpatient hospitalisations (%)					
Never	37.1	115	37.1	33	0.37
Once	21.9	68	20.2	18	
2-5 times	26.8	83	21.4	19	
More than 5 times	14.2	44	21.4	19	
Number of years since first contact with mental health services (%)					
Less than 3 months	18.1	56	12.5	11	0.57
3 months – 1 year	9.0	28	12.5	11	
1-2 years	6.8	21	8.0	7	
2-10 years	30.7	95	35.2	31	
More than 10 years	35.5	110	31.8	28	
Diagnosis (%)					
Psychosis	25.2	77	33.7	29	0.31
Bipolar affective disorder/Manic episode	16.7	51	15.1	13	
Depressive/Anxiety disorders	37.3	114	26.7	23	
Personality disorders	12.4	38	16.3	14	
Other disorders	8.5	26	8.1	7	
Overall symptom severity (M ± SD; range 24−168)	43.5 ± 11.5	309	45.1 ± 12.9	84	0.29
Affective symptoms (M ± SD; range 4−28)	12.5 ± 5.5	310	12.7 ± 6.4	89	0.80
Self-rated recovery (M ± SD; range 0−88)	51.8 ± 17.0	308	50.4 ± 18.6	89	0.52
Health-related quality of life (M ± SD; range 0−100)	52.9± 23.6	309	53.1 ± 26.0	87	0.96

Abbreviations: M = mean; SD = standard deviation; N = number of participants.

For instruments (loneliness, social network size, social capital, overall symptom severity, affective symptoms, self-rated recovery, health-related quality of life) range of scores is indicated between brackets.

[a] Significant p-values printed in bold.

9.2 Descriptive results of outcomes at 4-month follow-up

The median overall symptom severity score at 4-month follow-up was 37 (IQR 30−48), the median affective symptoms score was 10 (IQR 6−15), the median for self-rated recovery was 59 (IQR 47−66), and the median for health-related quality of life was 60 (IQR 50−76). As these total scores were all slightly skewed, their median and IQR are reported in Table 9.2.

Table 9.2: Descriptive results of outcome variables at 4-month follow-up

Variables	Median (IQR)
Overall symptom severity (24−168)	37 (30−48)
Affective symptoms (4−28)	10 (6−15)
Self-rated recovery (0−88)	59 (47−66)
Health-related quality of life (0−100)	60 (50−76)

Abbreviations: IQR = interquartile range.

For instruments (overall symptom severity, affective symptoms, self-rated recovery, health-related quality of life) range of scores is indicated between brackets.

These four outcomes significantly improved from baseline to 4-month follow-up (Table 9.3). Overall symptom severity (mean (SD) 43.6 (11.5) vs 40.0 (11.9), p < 0.001) and affective symptoms (mean (SD) 12.5 (5.5) vs 10.8 (5.3), p < 0.001) decreased between the two time points, while self-rated recovery (mean (SD) 51.8 (17.0) vs 56.8 (15.9), p < 0.001) and health related quality of life (mean (SD) 53.1 (23.7) vs 59.6 (21.7), p < 0.001) increased. However, the effect size of their change was small (Cohen's d -0.29 – 0.33).

Table 9.3: Differences between outcome variables at baseline and those at 4-month follow-up

Variables	Baseline (M ± SD)	Follow-up (M ± SD)	p-Value	Effect size (Cohen's d)
Overall symptom severity (24−168)	43.6 ± 11.5	40.0 ± 11.9	< 0.001	0.33
Affective symptoms (4−28)	12.5 ± 5.5	10.8 ± 5.3	< 0.001	0.32
Self-rated recovery (0−88)	51.8 ± 17.0	56.8 ± 15.9	< 0.001	-0.32
Health-related quality of life (0−100)	53.1 ± 23.7	59.6 ± 21.7	< 0.001	-0.29

Abbreviations: M = mean; SD = standard deviation.

For instruments (overall symptom severity, affective symptoms, self-rated recovery, health-related quality of life) range of scores is indicated between brackets.

9.3 Baseline factors associated with outcomes at 4-month follow-up in people with mental health problems

Table 9.4 presents the results of univariate linear regression analyses for factors associated with overall symptom severity, affective symptoms, self-rated recovery and health-related quality of life at 4-month follow-up respectively.

In the univariate linear regression models with overall symptom severity at follow-up as dependent variable, respondents in regular employment was associated with less severe overall symptoms than those with no employment (coefficient = -6.03, 95% CI -8.93 — -3.13, $p < 0.001$). Improved overall symptom severity was additionally associated with living with a partner or with family (coefficient = -3.50, 95% CI -6.16 — -0.84, $p = 0.01$). In terms of psychosocial variables, less feelings of loneliness (coefficient = 0.92 (per point on symptom scale), 95% CI 0.66—1.17, $p < 0.001$), bigger social network size (coefficient = -1.04, 95% CI -1.62 — -0.46, $p < 0.001$) and greater social capital (coefficient = -0.97, 95% CI -1.44 — -0.50, $p < 0.001$) were determinants of improved overall symptom severity. Moreover, more severe overall symptoms were associated with 2-10 years (coefficient = 4.20, 95% CI 0.28—8.13, $p = 0.04$) and more than 10 years (coefficient = 4.17, 95% CI 0.34—8.01, $p = 0.03$) since first contact with mental health services than less than 3 months. When affective symptoms score at 4-month follow-up was used as dependent variable, the factors related to the outcome were similar to the above ones except that personality disorders was associated with more severe affective symptoms than psychosis (coefficient = 3.98, 95% CI 1.92—6.04, $p < 0.001$), whilst number of years since first contact with mental health services became non-significant.

In the univariate analyses, there were statistically significant differences in self-rated recovery scores for the whole sample at follow-up in terms of different employment statuses, loneliness, social network size, social capital, number of years since first contact with mental health services, and diagnoses. When health-related quality of life at 4-month follow-up was used as dependent variable, the factors related to the outcome were similar to the above ones except that the diagnosis of other disorders was associated with better quality of life than psychosis (coefficient = 9.82, 95% CI 0.17—19.47, *p* = 0.046), but not the diagnosis of personality disorders which was related to poorer self-rated recovery than psychosis (coefficient = -7.35, 95% CI -13.50 — -1.20, *p* = 0.02).

Table 9.4: Results of univariate linear regression analyses for baseline factors associated with outcomes at 4-month follow-up

Variables	Overall symptoms[a]	Affective symptoms[b]	Self-rated recovery[c]	Health-related quality of life[d]
	Regression coefficients (95% CI)			
Socio-demographic variables				
Age (years)	0.04	0.01	0.03	-0.05
	(-0.06—0.15)	(-0.03—0.06)	(-0.11—0.17)	(-0.24—0.14)
Gender (0 = Male, 1 = Female)	2.17*	1.09*	-0.44	-3.42*
	(-0.57—4.91)	(-0.14—2.32)	(-4.08—3.19)	(-8.44—1.59)
Ethnic background				
White British	reference			
White Other	-3.40*	-1.64*	3.66*	4.78
	(-7.83—1.04)	(-3.62—0.35)	(-2.24—9.56)	(-3.52—13.08)
Black/Black British	0.78	-0.51	2.41	1.27
	(-2.80—4.36)	(-2.11—1.09)	(-2.34—7.16)	(-5.29—7.84)
Asian/Asian British	-1.21	-1.44*	-0.67	0.50
	(-5.88—3.46)	(-3.53—0.65)	(-6.89—5.54)	(-8.03—9.03)
Mixed	-0.02	-1.80*	3.02	-1.51
	(-5.36—5.32)	(-4.18—0.59)	(-4.08—10.13)	(-11.26—8.23)
Born in the UK (0 = No, 1 = Yes)	2.86*	1.21*	-2.95*	-4.22*
	(-0.30—6.01)	(-0.20—2.63)	(-7.16—1.25)	(-10.04—1.61)

Variables	Overall symptoms[a]	Affective symptoms[b]	Self-rated recovery[c]	Health-related quality of life[d]
	Regression coefficients (95% CI)			
(Continued from previous page)				
Housing (0 = Other, 1 = Independent accommodation)	-4.73*	-0.88	1.93	3.88
	(-9.69—0.24)	(-3.13—1.36)	(-4.58—8.45)	(-5.01—12.78)
Contact with children under 16	-1.14	-1.14*	1.07	3.82
(0 = Other, 1 = Living with children)	(-4.73—2.46)	(-2.75—0.47)	(-3.72—5.85)	(-2.72—10.36)
Education attainment				
No qualifications	reference			
Other qualifications	-3.07*	-0.52	2.23	1.78
	(-6.71—0.57)	(-2.18—1.13)	(-2.62—7.07)	(-4.87—8.42)
Degree	-3.88*	-0.42	1.81	-1.92
	(-7.87—0.11)	(-2.24—1.40)	(-3.51—7.13)	(-9.25—5.40)
Employment				
No	reference			
In voluntary, protected or sheltered work	-1.97	-1.80*	4.60*	4.88
	(-6.61—2.67)	(-3.92—0.32)	(-1.68—10.88)	(-3.84—13.59)
In regular employment	-6.03**	-1.41**	4.44**	7.41**
	(-8.93— -3.13)	(-2.73— -0.09)	(0.53—8.34)	(2.04—12.77)
Living with a partner or with family (0 = No, 1 = Yes)	-3.50**	-1.47**	2.51*	4.90*
	(-6.16— -0.84)	(-2.67— -0.28)	(-1.06—6.08)	(-0.02—9.82)
Psychosocial variables				
Loneliness (ULS-8)	0.92**	0.41**	-1.38**	-1.69**
	(0.66—1.17)	(0.30—0.53)	(-1.71— -1.05)	(-2.16— -1.23)
Social network size (2 items from LSNS-6)	-1.04**	-0.37**	1.32**	2.29**
	(-1.62— -0.46)	(-0.63— -0.11)	(0.55—2.08)	(1.25—3.34)
Social capital (HLSSC)	-0.97**	-0.39**	1.24**	1.74**
	(-1.44— -0.50)	(-0.60— -0.18)	(0.62—1.86)	(0.89—2.59)
Psychiatric variables				
Number of psychiatric inpatient hospitalisations				
Never	reference			
Once	-0.30	-0.27	-1.96	-0.76
	(-3.94—3.33)	(-1.89—1.36)	(-6.74—2.81)	(-7.38—5.86)
2-5 times	1.45	-0.53	-2.02	-2.92
	(-1.95—4.86)	(-2.06—1.00)	(-6.51—2.48)	(-9.13—3.28)
More than 5 times	1.93	-0.50	2.14	-2.69
	(-2.24—6.10)	(-2.37—1.38)	(-3.39—7.67)	(-10.38—4.99)

Variables	Overall symptoms[a]	Affective symptoms[b]	Self-rated recovery[c]	Health-related quality of life[d]
	Regression coefficients (95% CI)			
(Continued from previous page)				
Number of years since first contact with mental health services				
Less than 3 months	reference			
3 months – 1 year	-1.27	-1.84*	-0.27	3.77
	(-6.65—4.11)	(-4.26—0.58)	(-7.26—6.72)	(-5.87—13.41)
1-2 years	5.63*	2.30*	-13.05**	-15.53**
	(-0.53—11.80)	(-0.42—5.02)	(-20.78— -5.32)	(-26.17— -4.89)
2-10 years	4.20**	1.00	-10.27**	-11.34**
	(0.28—8.13)	(-0.77—2.77)	(-15.36— -5.18)	(-18.45— -4.23)
More than 10 years	4.17**	0.79	-5.64**	-10.33**
	(0.34—8.01)	(-0.93—2.52)	(-10.60— -0.68)	(-17.20— -3.45)
Diagnosis				
Psychosis	reference			
Bipolar affective disorder/Manic episode	-2.46	0.13	0.49	1.52
	(-6.67—1.74)	(-1.74—1.99)	(-5.12—6.09)	(-6.20—9.25)
Depressive/Anxiety disorders	-0.90	1.48*	-2.82*	-1.53
	(-4.35—2.56)	(-0.05—3.01)	(-7.40—1.75)	(-7.85—4.79)
Personality disorders	4.00*	3.98**	-7.35**	-3.61
	(-0.65—8.66)	(1.92—6.04)	(-13.50— -1.20)	(-12.12—4.90)
Other disorders	-3.23*	0.61	3.05	9.82**
	(-8.51—2.05)	(-1.73—2.95)	(-3.99—10.08)	(0.17—19.47)

Abbreviations: ULS-8 = UCLA Loneliness Scale-8; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire.

[a] Using univariate linear regression analyses with overall symptom severity score at 4-month follow-up as dependent variable. Negative regression coefficient = less severe overall symptoms.

[b] Using univariate linear regression analyses with affective symptoms score at 4-month follow-up as dependent variable. Negative regression coefficient = less severe affective symptoms.

[c] Using univariate linear regression analyses with self-rated recovery score at 4-month follow-up as dependent variable. Negative regression coefficient = poorer self-rated recovery.

[d] Using univariate linear regression analyses with health-related quality of life score at 4-month follow-up as dependent variable. Negative regression coefficient = poorer health-related quality of life.

* $p < 0.25$

** $p < 0.05$

9.4 Association between loneliness at baseline and overall symptom severity at follow-up

Univariate linear regression analysis showed that baseline loneliness was a significant risk factor of overall symptom severity during follow-up, with greater loneliness related to more severe overall symptoms (coefficient = 0.92, 95% CI 0.66—1.17, $p < 0.001$). This association persisted after adjusting for social network size and social capital, although the association between loneliness and overall symptom severity was slightly reduced (coefficient = 0.77, 95% CI 0.50—1.05, $p < 0.001$). In model 3 where all the three blocks of independent variables (psychosocial, socio-demographic and psychiatric variables associated with both baseline loneliness and follow-up overall symptom severity with $p < 0.25$) were entered into the regression equation, a 1-point higher loneliness score was associated with a 0.74-point (95% CI 0.45—1.02, $p < 0.001$) higher overall symptom severity score at follow-up. The model explained 18.1% of the variance in overall symptom severity. However, when baseline overall symptom severity score was considered simultaneously in model 4, only baseline symptom severity predicted overall symptoms at 4-month follow-up (coefficient = 0.49, 95% CI 0.38—0.61, $p < 0.001$). The final model explained 34.4% of the variance in overall symptom severity. The results of the four models are presented in Table 9.5.

Table 9.5: Potential risk factors of severe overall symptoms at 4-month follow-up[a]

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient	95% CI	*p*-Value[b]	Coefficient[c]	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
Psychosocial variables												
Loneliness (ULS-8)	0.92	0.66—1.17	**< 0.001**	0.77	0.50—1.05	**< 0.001**	0.74	0.45—1.02	**< 0.001**	0.25	-0.03—0.53	0.08
Social network size (2 items from LSNS-6)				-0.37	-0.95—0.22	0.22	-0.34	-0.95—0.27	0.27	-0.36	-0.91—0.19	0.20
Social capital (HLSSC)				-0.49	-0.97 — -0.02	**0.04**	-0.29	-0.78—0.20	0.25	-0.08	-0.53—0.36	0.71
Socio-demographic variables												
Born in the UK (0 = No, 1 = Yes)							1.78	-1.32—4.89	0.26	2.59	-0.20—5.39	0.07
Housing (0 = Other, 1 = Independent accommodation)							-2.92	-7.70—1.87	0.23	-0.15	-4.50—4.19	0.95
Employment												
No							reference					
In voluntary, protected or sheltered work							-0.85	-5.29—3.60	0.71	0.21	-3.78—4.21	0.92
In regular employment							-3.81	-6.79 — -0.82	**0.01**	-2.65	-5.35—0.05	0.06
Living with a partner or with family (0 = No, 1 = Yes)							-0.61	-3.36—2.13	0.66	-0.38	-2.86—2.10	0.76
Psychiatric variables												
Number of years since first contact with mental health services												
Less than 3 months							reference					
3 months – 1 year							-2.93	-8.03—2.18	0.26	-2.13	-6.71—2.45	0.36
1-2 years							0.59	-5.28—6.46	0.84	2.31	-2.97—7.59	0.39
2-10 years							1.62	-2.26—5.50	0.41	1.50	-1.98—4.98	0.40
More than 10 years							0.63	-3.50—4.77	0.76	-0.07	-3.80—3.65	0.97

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient	95% CI	*p*-Value[b]	Coefficient[c]	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
(Continued from previous page)												
Diagnosis												
Psychosis							reference					
Bipolar affective disorder/Manic episode							-0.43	-4.47—3.62	0.84	0.29	-3.34—3.93	0.87
Depressive/Anxiety disorders							0.05	-3.49—3.58	0.98	0.51	-2.66—3.68	0.75
Personality disorders							2.13	-2.26—6.53	0.34	1.11	-2.87—5.10	0.58
Other disorders							-2.99	-8.10—2.12	0.25	-2.75	-7.33—1.84	0.24
Overall symptoms at baseline (BPRS)										0.49	0.38—0.61	**< 0.001**
R^2_{adj}	0.138			0.149			0.181			0.344		

Abbreviations: CI = Confidence Interval; ULS-8 = UCLA Loneliness Scale-8; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; BPRS = Brief Psychiatric Rating Scale; R^2_{adj} = adjusted-R^2.

[a] Using multivariable linear regression analyses with overall symptom severity score at 4-month follow-up as dependent variable and factors with *p* < 0.25 in both table 8.3 and table 9.4 as independent variables.

[b] Significant *p*-values printed in bold.

[c] Negative regression coefficient = less severe overall symptoms.

9.5 Association between loneliness at baseline and affective symptoms at follow-up

Univariate linear regression analysis showed that baseline loneliness was a significant risk factor of affective symptom severity during follow-up, with greater loneliness associated with more severe affective symptoms (coefficient = 0.41, 95% CI 0.30—0.53, p < 0.001). This association persisted after adjustment for social network size and social capital, although the association between loneliness and affective symptoms was slightly reduced (coefficient = 0.37, 95% CI 0.24—0.49, p < 0.001). In model 3 where all the three blocks of independent variables (psychosocial, socio-demographic and psychiatric variables associated with both baseline loneliness and follow-up affective symptoms with p < 0.25) were entered, per 1-point increase in baseline loneliness score there is a 0.34-point (95% CI 0.21—0.47, p < 0.001) increase in affective symptoms score at follow-up. The model explained 16.8% of the variability of affective symptoms. However, in the fully adjusted model 4 where baseline affective symptoms score was also entered, more severe affective symptoms at 4-month follow-up were only predicted by its baseline score (coefficient = 0.42, 95% CI 0.31—0.53, p < 0.001) and having a diagnosis of personality disorders (coefficient = 2.11, 95% CI 0.27—3.95, p = 0.03) (with psychosis used as a reference category). The percentage of the explained variability of affective symptoms rose to 30%. The results of the four models are presented in Table 9.6.

Table 9.6: Potential risk factors of severe affective symptoms at 4-month follow-up[a]

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient	95% CI	p-Value[b]	Coefficient[c]	95% CI	p-Value	Coefficient	95% CI	p-Value	Coefficient	95% CI	p-Value
Psychosocial variables												
Loneliness (ULS-8)	0.41	0.30—0.53	**< 0.001**	0.37	0.24—0.49	**< 0.001**	0.34	0.21—0.47	**< 0.001**	0.11	-0.02—0.24	0.10
Social network size (2 items from LSNS-6)				-0.06	-0.32—0.21	0.68	-0.02	-0.30—0.25	0.88	-0.06	-0.31—0.19	0.64
Social capital (HLSSC)				-0.19	-0.40—0.02	0.08	-0.10	-0.32—0.12	0.39	-0.04	-0.25—0.16	0.67
Socio-demographic variables												
Born in the UK (0 = No, 1 = Yes)							0.50	-0.89—1.89	0.48	0.52	-0.75—1.80	0.42
Employment												
No							reference					
In voluntary, protected or sheltered work							-0.95	-2.96—1.06	0.35	-0.06	-1.92—1.79	0.95
In regular employment							-0.70	-2.05—0.65	0.31	-0.82	-2.06—0.42	0.19
Living with a partner or with family (0 = No, 1 = Yes)							-0.72	-1.94—0.50	0.25	-0.76	-1.88—0.36	0.18
Psychiatric variables												
Number of years since first contact with mental health services												
Less than 3 months							reference					
3 months – 1 year							-2.26	-4.56—0.05	0.06	-1.98	-4.09—0.14	0.07
1-2 years							0.44	-2.21—3.09	0.75	0.78	-1.65—3.21	0.53
2-10 years							0.03	-1.72—1.78	0.97	-0.12	-1.73—1.49	0.88
More than 10 years							-0.28	-2.14—1.58	0.77	-0.48	-2.18—1.23	0.58

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient	95% CI	*p*-Value[b]	Coefficient[c]	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
(Continued from previous page)												
Diagnosis												
Psychosis							reference					
Bipolar affective disorder/Manic episode							0.83	-0.99—2.64	0.37	0.89	-0.78—2.56	0.29
Depressive/Anxiety disorders							1.52	-0.06—3.10	0.06	0.75	-0.72—2.21	0.32
Personality disorders							3.16	1.18—5.14	**0.002**	2.11	0.27—3.95	**0.03**
Other disorders							0.65	-1.65—2.96	0.58	-0.40	-2.53—1.73	0.71
Affective symptoms at baseline (4 items from BPRS)										0.42	0.31—0.53	**< 0.001**
R^2_{adj}	0.138			0.138			0.168			0.300		

Abbreviations: CI = Confidence Interval; ULS-8 = UCLA Loneliness Scale-8; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; BPRS = Brief Psychiatric Rating Scale; R^2_{adj} = adjusted-R^2.

[a] Using multivariable linear regression analyses with affective symptoms score at 4-month follow-up as dependent variable and factors with *p* < 0.25 in both table 8.3 and table 9.4 as independent variables.

[b] Significant *p*-values printed in bold.

[c] Negative regression coefficient = less severe affective symptoms.

9.6 Association between loneliness at baseline and self-rated recovery at follow-up

Univariate linear regression result showed that greater baseline loneliness was associated with poorer self-rated recovery during follow-up (coefficient = -1.38, 95% CI -1.71 — -1.05, $p < 0.001$). The association remained significant when social network size and social capital were entered into model 2 (coefficient = -1.21, 95% CI -1.57 — -0.85, $p < 0.001$). After additionally adjusting for psychosocial, socio-demographic and psychiatric variables (model 3), loneliness was still a significant predictor of recovery at follow-up, with a 1-point higher loneliness score associated with a 1.08-point (95% CI -1.45 — -0.71, $p < 0.001$) lower recovery score. The model explained 21.9% of the variability of self-rated recovery. However, when baseline self-rated recovery score was considered simultaneously in model 4, poorer recovery at 4-month follow-up was only predicted by lower baseline recovery score (coefficient = 0.48, 95% CI 0.37—0.59, $p < 0.001$), 1-2 years (coefficient = -10.72, 95% CI -17.40 — -4.02, $p = 0.002$) and 2-10 years (coefficient = -7.84, 95% CI -12.35 — -3.33, $p = 0.001$) since first contact with mental health services (with less than 3 months used as a reference category). The percentage of the explained variability of self-rated recovery increased to 39%. The results of the four models are presented in Table 9.7.

Table 9.7: Potential risk factors of poor self-rated recovery at 4-month follow-up[a]

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient[b]	95% CI	*p*-Value[c]	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
Psychosocial variables												
Loneliness (ULS-8)	-1.38	-1.71 — -1.05	**< 0.001**	-1.21	-1.57 — -0.85	**< 0.001**	-1.08	-1.45 — -0.71	**< 0.001**	-0.25	-0.63—0.13	0.19
Social network size (2 items from LSNS-6)				0.29	-0.47—1.04	0.45	0.55	-0.24—1.34	0.17	0.32	-0.38—1.02	0.37
Social capital (HLSSC)				0.54	-0.07—1.15	0.08	0.44	-0.19—1.08	0.17	0.15	-0.42—0.17	0.62
Socio-demographic variables												
Born in the UK (0 = No, 1 = Yes)							-1.38	-5.41—2.64	0.50	-0.19	-3.78—3.40	0.92
Employment												
No							reference					
In voluntary, protected or sheltered work							3.56	-2.25—9.37	0.23	-0.80	-6.11—4.52	0.77
In regular employment							1.05	-2.84—4.95	0.60	1.34	-2.12—4.79	0.45
Living with a partner or with family (0 = No, 1 = Yes)							-0.99	-4.49—2.51	0.58	0.13	-3.00—3.27	0.93
Psychiatric variables												
Number of years since first contact with mental health services												
Less than 3 months							reference					
3 months – 1 year							0.40	-6.26—7.06	0.91	-1.43	-7.43—4.57	0.64
1-2 years							-9.90	-17.41 — -2.38	**0.01**	-10.72	-17.40 — -4.02	**0.002**
2-10 years							-8.78	-13.82 — -3.74	**0.001**	-7.84	-12.35 — -3.33	**0.001**
More than 10 years							-4.12	-9.47—1.23	0.13	-4.49	-9.30—0.32	0.07

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient[b]	95% CI	*p*-Value[c]	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
(Continued from previous page)												
Diagnosis												
Psychosis							reference					
Bipolar affective disorder/Manic episode							0.32	-4.93—5.56	0.91	-1.55	-6.22—3.12	0.51
Depressive/Anxiety disorders							-1.20	-5.76—3.36	0.60	-0.60	-4.69—3.48	0.77
Personality disorders							-3.53	-9.18—2.12	0.22	-3.09	-8.12—1.93	0.23
Other disorders							3.19	-3.46—9.84	0.35	3.97	-1.97—9.91	0.19
Self-rated recovery at baseline (QPR)										0.48	0.37—0.59	**< 0.001**
R^2_{adj}	0.177			0.176			0.219			0.390		

Abbreviations: CI = Confidence Interval; ULS-8 = UCLA Loneliness Scale-8; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; QPR = Questionnaire on the Process of Recovery; R^2_{adj} = adjusted-R^2.

[a] Using multivariable linear regression analyses with self-rated recovery score at 4-month follow-up as dependent variable and factors with *p* < 0.25 in both table 8.3 and table 9.4 as independent variables.

[b] Negative regression coefficient = poorer self-rated recovery.

[c] Significant *p*-values printed in bold.

9.7 Association between loneliness at baseline and health-related quality of life at follow-up

Greater baseline loneliness was associated with poorer health-related quality of life during follow-up (coefficient = -1.69, 95% CI -2.16 — -1.23, p < 0.001) in the first univariate linear regression model. The association remained significant when social network size and social capital were adjusted for in model 2 (coefficient = -1.38, 95% CI -1.88 — -0.87, p < 0.001). After entering the three blocks of psychosocial, socio-demographic and psychiatric variables into model 3, loneliness was still a significant predictor of quality of life at follow-up. Per 1-point increase in baseline loneliness score there is a 1.27-point (95% CI -1.79 — -0.75, p < 0.001) decrease in health-related quality of life score at follow-up. The model explained 20.7% of the variance in quality of life. In the final model, this association persisted when baseline quality of life score was considered simultaneously in model 4. Poorer quality of life at 4-month follow-up was predicted by greater loneliness (coefficient = -0.76, 95% CI -1.31 — -0.20, p = 0.01), 1-2 years (coefficient = -10.21, 95% CI -20.36 — -0.06, p = 0.049) and 2-10 years (coefficient = -9.01, 95% CI -15.90 — -2.13, p = 0.01) since first contact with mental health services (with less than 3 months used as a reference category). Better quality of life at follow-up, however, was predicted by larger social network size (coefficient = 1.23, 95% CI 0.15—2.30, p = 0.03), having a diagnosis of other disorders (coefficient = 10.18, 95% CI 1.25—19.11, p = 0.03) (with psychosis used as a reference category), and higher baseline quality of life score (coefficient = 0.24, 95% CI 0.13—0.35, p < 0.001). The explained adjusted variance for EQ-VAS was 25.6%. The results of the four models are presented in Table 9.8.

Tables 9.5 – 9.8 provide multivariable linear regression analyses for baseline factors associated with overall symptom severity, affective symptoms,

self-rated recovery and health-related quality of life at 4-month follow-up respectively. Loneliness was the most significant predictor of the four outcomes in model 3, better than social network size, living with a partner or with family, and neighbourhood social capital. After controlling for the outcomes at baseline in model 4, however, greater loneliness predicted poorer health-related quality of life but did not predict the other three outcomes. Findings of this chapter are discussed in Section 11.1 Part Ⅱ.

Table 9.8: Potential risk factors of poor health-related quality of life at 4-month follow-up[a]

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient[b]	95% CI	*p*-Value[c]	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
Psychosocial variables												
Loneliness (ULS-8)	-1.69	-2.16 — -1.23	**< 0.001**	-1.38	-1.88 — -0.87	**< 0.001**	-1.27	-1.79 — -0.75	**< 0.001**	-0.76	-1.31 — -0.20	**0.01**
Social network size (2 items from LSNS-6)				1.04	-0.02—2.10	0.06	1.27	0.16—2.38	**0.03**	1.23	0.15—2.30	**0.03**
Social capital (HLSSC)				0.80	-0.05—1.65	0.07	0.63	-0.25—1.52	0.16	0.39	-0.47—1.25	0.37
Socio-demographic variables												
Born in the UK (0 = No, 1 = Yes)							-3.28	-8.92—2.37	0.25	-3.42	-8.91—2.07	0.22
Employment												
No							reference					
In voluntary, protected or sheltered work							1.97	-6.21—10.15	0.64	-0.30	-8.30—7.70	0.94
In regular employment							2.49	-2.98—7.96	0.37	2.09	-3.25—7.43	0.44
Living with a partner or with family (0 = No, 1 = Yes)							-0.03	-4.93—4.88	0.99	-0.31	-5.07—4.45	0.90
Psychiatric variables												
Number of years since first contact with mental health services												
Less than 3 months							reference					
3 months – 1 year							6.23	-3.03—15.49	0.19	6.33	-2.64—15.31	0.17
1-2 years							-10.15	-20.62—0.31	0.06	-10.21	-20.36 — -0.06	**0.049**
2-10 years							-8.79	-15.87 — -1.70	**0.02**	-9.01	-15.90 — -2.13	**0.01**
More than 10 years							-6.68	-14.15—0.78	0.08	-6.43	-13.66—0.81	0.08

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient[b]	95% CI	*p*-Value[c]	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
(Continued from previous page)												
Diagnosis												
Psychosis							reference					
Bipolar affective disorder/Manic episode							-0.07	-7.35—7.22	0.99	1.80	-5.33—8.92	0.62
Depressive/Anxiety disorders							-2.23	-8.60—4.14	0.49	-0.58	-6.82—5.67	0.86
Personality disorders							0.65	-7.23—8.54	0.87	3.02	-4.70—10.74	0.44
Other disorders							9.08	-0.11—18.27	0.05	10.18	1.25—19.11	**0.03**
Health-related quality of life at baseline (EQ VAS)										0.24	0.13—0.35	**< 0.001**
R^2_{adj}	0.143			0.158			0.207			0.256		

Abbreviations: CI = Confidence Interval; ULS-8 = UCLA Loneliness Scale-8; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; EQ VAS = EuroQol Health Questionnaire visual analogue scale; R^2_{adj} = adjusted-R^2.

[a] Using multivariable linear regression analyses with health-related quality of life score at 4-month follow-up as dependent variable and factors with *p* < 0.25 in both table 8.3 and table 9.4 as independent variables.

[b] Negative regression coefficient = poorer health-related quality of life.

[c] Significant *p*-values printed in bold.

Chapter 10: Quantitative study results: the efficacy of peer-provided self-management intervention for loneliness among people leaving crisis resolution teams

Chapter 5 described the theoretical basis of the peer-provided self-management intervention and its potential impact on loneliness. The randomised controlled trial (RCT) in the CORE study with loneliness as one of the secondary outcomes of the main trial provided an opportunity to explore the impact of a peer-provided self-management intervention on loneliness. The methods for exploring the effect of the intervention on loneliness were described in Chapters 6 and 7. In this Chapter, the results are reported of whether there is any difference in loneliness at 4-month follow-up between participants who were offered the peer-provided self-management intervention and those in the control group who were not.

10.1 Balance of baseline characteristics

Of the 401 participants recruited, 200 were randomly assigned to the intervention group and 201 to the control group. However, two participants withdrew their consent for their data to be used (one from the intervention group and one from the control group), which led to 399 participants available for analyses with 199 in the intervention group and 200 in the control group. Socio-demographic and clinical characteristics of the two groups are given in Table 10.1. There were no obvious differences at baseline in socio-demographic and clinical characteristics between people assigned to the two groups. Among people assigned to the intervention group, 48 did not receive intervention at all, 9 discontinued support after 1 or 2 sessions and 44 were lost to follow-up interview. Of the people assigned to the control group, 47 were not interviewed at follow up. The rates of dropout from the follow-up

interview in the intervention and control groups were not significantly different (22.0% vs 23.4% at four months, *p* = 0.74).

Table 10.1: Baseline socio-demographic and clinical characteristics of participants randomly assigned to intervention or control group

Characteristic	Intervention (*N* = 199)		Control (*N* = 200)	
	M ± SD/%	N	M ± SD/%	N
Age (M±SD)	40.0 ± 13.3	199	40.4 ± 12.5	199
Gender (%)				
Male	40.7	81	39.7	79
Female	59.3	118	60.3	120
Ethnic background (%)				
White British	53.8	107	53.8	107
White Other	10.1	20	10.1	20
Black/Black British	20.6	41	19.6	39
Asian/Asian British	9.1	18	9.6	19
Mixed	6.5	13	7.0	14
Born in the UK (%)				
No	20.3	40	25.0	49
Yes	79.7	157	75.0	147
Housing (%)				
Independent accommodation	87.9	174	91.5	183
Other	12.1	24	8.5	17
Contact with children under 16 (%)				
Living with dependent children	15.1	30	18.5	37
Other	84.9	169	81.5	163
Education attainment (%)				
No qualifications	21.2	42	17.0	34
Other qualifications	55.6	110	51.5	103
Degree	23.2	46	31.5	63
Employment (%)				
No	64.3	128	64.5	129
In voluntary, protected or sheltered work	9.1	18	7.5	15
In regular employment	26.6	53	28.0	56
Living with a partner or with family (%)				
No	55.6	110	51.5	103
Yes	44.4	88	48.5	97
Loneliness (M ± SD; range 8−32)	21.9 ± 5.0	199	21.9 ± 5.0	200
Social network size (M ± SD; range 0−10)	4.9 ± 2.1	199	4.9 ± 2.4	200
Social capital (M ± SD; range -6−6)	2.6 ± 2.7	197	2.3 ± 3.2	199
Number of psychiatric inpatient hospitalisations (%)				
Never	34.7	69	39.5	79
Once	24.1	48	19.0	38
2-5 times	24.1	48	27.0	54
More than 5 times	17.1	34	14.5	29

Characteristic	Intervention (*N* = 199)		Control (*N* = 200)	
	M ± SD/%	*N*	M ± SD/%	*N*
(Continued from previous page)				
Number of years since first contact with mental health services (%)				
Less than 3 months	16.7	33	17.0	34
3 months – 1 year	13.6	27	6.0	12
1-2 years	7.6	15	6.5	13
2-10 years	27.3	54	36.0	72
More than 10 years	34.9	69	34.5	69
Affective symptoms (M ± SD; range 4−28)	12.3 ± 5.7	199	12.9 ± 5.8	200
Positive symptoms (M ± SD; range 4−28)	7.1 ± 4.4	197	6.9 ± 4.1	199
Negative symptoms (M ± SD; range 3-21)	4.6 ± 2.2	198	4.8 ± 2.2	199
Diagnosis (%)				
Psychosis	28.4	56	25.6	50
Bipolar affective disorder/Manic episode	17.8	35	14.9	29
Depressive/Anxiety disorders	33.0	65	36.9	72
Personality disorders	11.7	23	14.9	29
Other disorders	9.1	18	7.7	15

Abbreviations: M = mean; SD = standard deviation; *N* = number of participants.

For instruments (loneliness, social network size, social capital, affective symptoms, positive symptoms, negative symptoms) range of scores is indicated between brackets.

10.2 Descriptive results of loneliness at 4-month follow-up

The mean of the loneliness total score at 4-month follow-up was 20.4 (SD = 5.1) and its median score was 21 (IQR 16-24) since the total score of loneliness exhibited slightly negative skew. The differences between loneliness at baseline and at 4-month follow-up are summarised in Table 10.2. The feelings of loneliness of all participants were significantly reduced from baseline to follow-up (mean (SD) 21.9 (4.9) vs 20.4 (5.1), $p < 0.001$), however the effect size was small (Cohen's d 0.30). The mean scores of loneliness decreased between the two time points in both intervention group and control group with small effect size (Cohen's d 0.33 and 0.27 respectively).

**Table 10.2: Differences between loneliness at baseline and at 4-month follow-up**

Loneliness (8−32)	All participants	Intervention group	Control group
Baseline (M ± SD)	21.9 ± 4.9	21.9 ± 5.0	21.9 ± 4.8
Follow-up (M ± SD)	20.4 ± 5.1	20.3 ± 4.9	20.5 ± 5.3
p-Value	< 0.001	< 0.001	< 0.001
Effect size (Cohen's d)	0.30	0.33	0.27

Abbreviations: M = mean; SD = standard deviation.

For instrument of loneliness, range of scores is indicated between brackets.

Figure 10.1 shows the responses to loneliness items at 4-month follow-up. The percentage of participants who chose never/rarely, sometimes or always as a response to each loneliness item did not seem to have a great difference between the intervention group and the control group. The three areas where there was the biggest difference between the groups were item 1 "lack companionship" (Always N (%) 26 (16.8%) vs 36 (23.4%)), item 4 "left out" (Always N (%) 20 (12.9%) vs 28 (18.2%)), and item 6 "find companionship when you want it" (Never/Rarely N (%) 34 (21.9%) vs 41 (26.6%)).

Figure 10.1: Responses to ULS-8 items at 4-month follow-up of participants randomly assigned to the intervention group or the control group
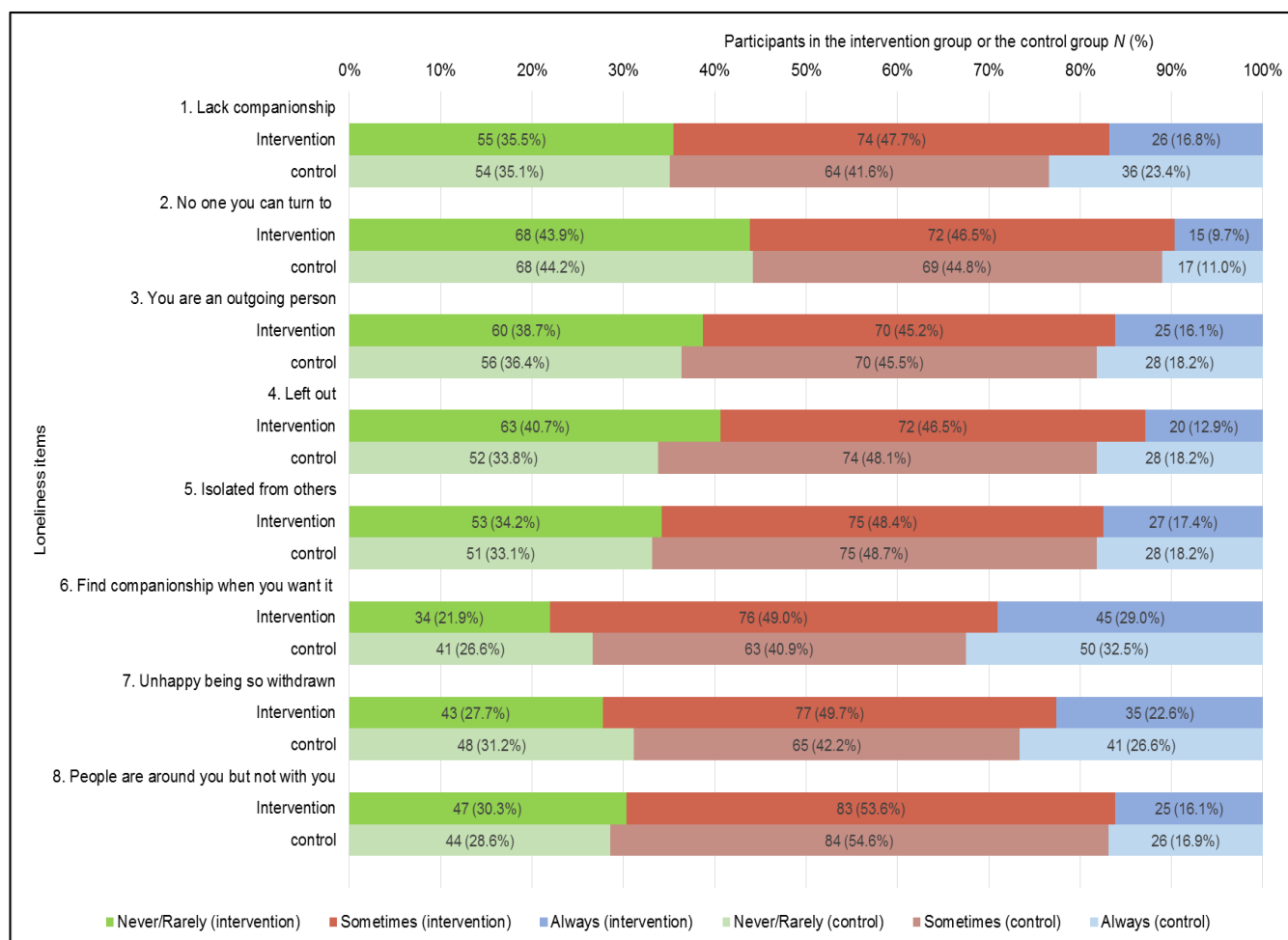
10.3 Baseline factors associated with loneliness at 4-month follow-up

A series of univariate linear regression analyses were carried out to examine which baseline factors should be adjusted for in the multivariable analyses in section 10.4. Baseline factors which were associated with loneliness in univariate analyses with $p < 0.25$ were entered into the multivariable models to test the hypthesis of this Chapter. Table 10.3 presents the results of univariate linear regression analyses for baseline factors associated with loneliness at 4-month follow-up. Participants were more likely to feel lonely if they were born in the UK, had contact with mental health services for longer years ("1-2 years", "2-10 years", and "More than 10 years") compared with less than three

months, presented more severe affective symptoms, positive symptoms or negative symptoms, or were diagnosed as personality disorders compared with psychosis. On the other hand, regular employment, living with a partner or with family, larger social network size and greater social capital were associated with less feelings of loneliness at follow-up. Other factors which were close to signficant included age, voluntary, protected or sheltered work, and more than 5 times of psychiatric inpatient hospitalisations.

Table 10.3:   Results of univariate linear regression analyses for baseline factors associated with loneliness at 4-month follow-up

Variables	Coefficient[a]	95% CI	p-Value[b]
Socio-demographic variables			
Age (years)	-0.03	-0.08−0.01	0.17*
Gender (0 = Male, 1 = Female)	0.53	-0.64−1.71	0.37
Ethnic background			
White British	reference		
White Other	-0.58	-2.49−1.32	0.55
Black/Black British	0.28	-1.26−1.81	0.72
Asian/Asian British	-0.52	-2.52−1.49	0.61
Mixed	1.29	-1.00−3.58	0.27
Born in the UK (0 = No, 1 = Yes)	1.51	0.15−2.86	**0.03**
Housing (0 = Other, 1 = Independent accommodation)	-0.19	-2.30−1.91	0.86
Contact with children under 16 (0 = Other, 1 = Living with dependent children)	-0.28	-1.82−1.26	0.72
Education attainment			
No qualifications	reference		
Other qualifications	0.35	-1.22−1.92	0.66
Degree	0.31	-1.41−2.04	0.72
Employment			
No	reference		
In voluntary, protected or sheltered work	-1.30	-3.35−0.75	0.21*
In regular employment	-1.73	-2.99 − -0.48	**0.01**
Living with a partner or with family (0 = No, 1 = Yes)	-1.73	-2.87 − -0.59	**0.003**

Variables	Coefficient[a]	95% CI	p-Value[b]
(Continued from previous page)			
Psychosocial variables			
Social network size (2 items from LSNS-6)	-0.63	-0.87 − -0.38	**< 0.001**
Social capital (HLSSC)	-0.39	-0.59 − -0.19	**< 0.001**
Psychiatric variables			
Number of psychiatric inpatient hospitalisations			
Never	reference		
Once	-0.31	-1.85−1.24	0.70
2-5 times	0.09	-1.37−1.54	0.91
More than 5 times	-1.06	-2.85−0.72	0.24*
Number of years since first contact with mental health services			
Less than 3 months	reference		
3 months – 1 year	-0.23	-2.53−2.06	0.84
1-2 years	3.28	0.74−5.81	**0.01**
2-10 years	2.25	0.58−3.92	**0.01**
More than 10 years	1.67	0.04−3.30	**0.04**
Affective symptoms (4 items from BPRS)	0.32	0.22−0.42	**< 0.001**
Positive symptoms (4 items from BPRS)	0.16	0.03−0.30	**0.02**
Negative symptoms (3 items from BPRS)	0.41	0.15−0.67	**0.002**
Diagnosis			
Psychosis	reference		
Bipolar affective disorder/Manic episode	-0.43	-2.23−1.38	0.64
Depressive/Anxiety disorders	0.72	-0.75−2.20	0.34
Personality disorders	2.71	0.73−4.69	**0.01**
Other disorders	-0.63	-2.89−1.64	0.59

Abbreviations: CI = Confidence Interval; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; BPRS = Brief Psychiatric Rating Scale.

[a] Negative regression coefficient = less loneliness

[b] Significant p-values printed in bold ($p < 0.05$).

* $p < 0.25$

10.4 Differences in loneliness at 4-month follow-up between participants in the intervention group and those in the control group

Table 10.4 shows the results of linear regression analyses investigating the effect of the peer-provided self-management intervention on loneliness. The level of loneliness at 4-month follow-up did not differ between the intervention group and the control group. The analysis produced the same results for all of the four models.

In model 3 when psychosocial, socio-demographic and psychiatric variables were adjusted, greater loneliness at follow-up was predicted by smaller social network size (coefficient = -0.53, 95% CI -0.83— -0.24, p = 0.001), born in the UK (coefficient = 1.53, 95% CI 0.29—2.77, p = 0.02), and more severe affective symptoms (coefficient = 0.23, 95% CI 0.12—0.35, p < 0.001). The amount of variance in follow-up loneliness explained by this model was 26.8%. However, after baseline loneliness total score was adjusted in model 4, only baseline loneliness became a significant predictor (coefficient = 0.60, 95% CI 0.47—0.72, p < 0.001). Model 4 explained 45.8% of the variance in loneliness at 4-month follow-up.

In short, the level of loneliness was reduced from baseline to follow-up in both groups but the effect size was small. Results from multivariable analyses did not suggest that feelings of loneliness in the intervention group were significantly different from the control group. Results of this chapter and several potential reasons for the failure to corroborate the hypothesis are discussed in Section 11.1 Part Ⅲ.

Table 10.4: Linear regression analyses investigating the effect of the peer-provided self-management intervention on loneliness[a]

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient[b]	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value[c]	Coefficient	95% CI	*p*-Value	Coefficient	95% CI	*p*-Value
Group allocation (0 = Control, 1 = Intervention)	-0.22	-1.32—0.89	0.70	-0.09	-1.13—0.96	0.87	0.12	-1.00—1.24	0.83	-0.19	-1.15—0.77	0.70
Psychosocial variables												
Social network size (2 items from LSNS-6)				-0.53	-0.80— -0.26	**< 0.001**	-0.53	-0.83— -0.24	**0.001**	-0.24	-0.55—0.06	0.12
Social capital (HLSSC)				-0.29	-0.48 — -0.09	**0.004**	-0.08	-0.28—0.13	0.46	0.04	-0.13—0.20	0.67
Socio-demographic variables												
Age (years)							-0.04	-0.08—0.01	0.11	-0.03	-0.07—0.01	0.20
Born in the UK (0 = No, 1 = Yes)							1.53	0.29—2.77	**0.02**	0.90	-0.23—2.03	0.12
Employment												
No							reference					
In voluntary, protected or sheltered work							0.03	-1.93—1.99	0.97	-0.18	-2.05—1.70	0.85
In regular employment							-0.74	-1.99—0.51	0.25	-0.47	-1.50—0.57	0.38
Living with a partner or with family (0 = No, 1 = Yes)							-1.02	-2.05—0.02	0.06	-0.61	-1.58—0.35	0.21
Psychiatric variables												
Number of psychiatric inpatient hospitalisations												
Never							reference					
Once							-0.47	-1.78—0.84	0.48	-0.17	-1.24—0.91	0.76
2-5 times							-0.70	-2.38—0.99	0.42	0.03	-1.55—1.61	0.97
More than 5 times							-1.85	-3.95—0.25	0.08	-0.27	-2.26—1.73	0.79

Variables	Model 1			Model 2			Model 3			Model 4		
	Coefficient[b]	95% CI	p-Value	Coefficient	95% CI	p-Value[c]	Coefficient	95% CI	p-Value	Coefficient	95% CI	p-Value
(Continued from previous page)												
Number of years since first contact with mental health services												
Less than 3 months							reference					
3 months – 1 year							-0.40	-2.02—1.22	0.63	-0.98	-2.83—0.87	0.30
1-2 years							2.08	-1.60—5.76	0.27	1.11	-2.01—4.23	0.48
2-10 years							1.92	0.01—3.82	0.05	0.90	-0.88—2.67	0.32
More than 10 years							1.10	-0.66—2.87	0.22	0.11	-1.58—1.81	0.89
Affective symptoms (4 items from BPRS)							0.23	0.12—0.35	**< 0.001**	0.02	-0.08—0.12	0.69
Positive symptoms (4 items from BPRS)							0.02	-0.15—0.18	0.85	-0.03	-0.18—0.11	0.65
Negative symptoms (3 items from BPRS)							0.13	-0.10—0.37	0.26	0.08	-0.12—0.28	0.43
Diagnosis												
Psychosis							reference					
Bipolar affective disorder/Manic episode							0.48	-1.57—2.52	0.65	0.62	-1.25—2.48	0.52
Depressive/Anxiety disorders							0.54	-1.45—2.53	0.59	0.23	-1.59—2.05	0.80
Personality disorders							1.00	-1.27—3.27	0.39	1.09	-0.94—3.13	0.29
Other disorders							-1.20	-3.17—0.77	0.23	-1.27	-3.16—0.63	0.19
Loneliness at baseline (ULS-8)										0.60	0.47—0.72	**< 0.001**
R^2	0.0004			0.099			0.268			0.458		

Abbreviations: CI = Confidence Interval; LSNS-6 = Lubben Social Network Scale-6; HLSSC = Health and Lifestyles Survey Social Capital Questionnaire; BPRS = Brief Psychiatric Rating Scale; ULS-8 = UCLA Loneliness Scale-8.

[a] Using multivariable linear regression analyses with loneliness total score at 4-month follow-up as dependent variable and factors with $p < 0.25$ in Table 10.3 as independent variables, clustering by peer support workers.

[b] Negative regression coefficient = less loneliness

[c] Significant p-values printed in bold.

Chapter 11: Discussion

11.1 Main findings

A conceptual and methodological review and a systematic review have been carried out and separately discussed in Chapters 3 and 4 respectively. The main results can be summarised as:

The conceptual review in Chapter 3 proposed a model with five domains incorporating all the concepts relevant to social isolation and loneliness in regular use in the mental health research literature. These five domains are: social network – quantity; social network – structure; social network – quality; appraisal of relationships – emotional; and appraisal of relationships – resources. The review also identified well-developed measures suitable for assessing each of the five conceptual domains or covering multi-domains. Potential uses are in allowing researchers and intervention developers to identify precisely the intended mechanisms and outcomes of interventions, and to choose the most appropriate measures to use in mental health settings.

The systematic review in Chapter 4 found substantial evidence from prospective studies that people with depression who perceive their social support as poorer have worse outcomes in terms of symptoms, recovery and social functioning. Loneliness has been investigated much less than perceived social support, but there is some evidence that greater loneliness predicts poorer depression outcome. There is also some preliminary evidence of associations between perceived social support and outcomes in schizophrenia, bipolar disorder and anxiety disorders. Loneliness and perceived social support in depression are potential targets for development and testing of interventions, while for other conditions further evidence is needed regarding relationships with outcomes.

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The two reviews provided some theoretical bases for the following quantitative study. Loneliness as a type of emotional appraisal of relationships was considered more likely to be associated with mental health outcomes compared to other quantitative information about someone's social relationships. ULS-8 was identified as a well-developed measure to assess loneliness in mental health service users. Given the existing evidence of the relationship between loneliness and depression outcome, affective symptoms were included as one of the outcomes in the quantitative study. The main findings from the quantitative study of loneliness and mental health problems in people leaving Crisis Resolution Teams (CRTs) are discussed below.

Part Ⅰ Epidemiology of loneliness in a group of crisis resolution team users

Our study suggests that loneliness is more frequent among people with mental health problems than in the general population, including samples both of younger and older adults. In this sample of CRT users the sense of loneliness seemed to be higher among people with mental health problems (M = 21.9, SD = 5.0) than young adults in the general population of 19-39 years old (M 15.78-16.08, SD 5.08-5.27) (Bonin, McCreary et al. 2000) and older adults in the general population of 65-89 years old (M = 13.1, SD = 6.9) (Mulasso, Roppolo et al. 2016), although their age ranges did not match the ages of our sample (18-75 years old). Comparable data from the general population were not found and thus we were not able to statistically compare the severity of loneliness between our sample and people from the general community. It would be ideal to match the two samples through a propensity score matching analysis based on potentially confounding covariates (Chrostek, Grygiel et al. 2016). However, since the mean score of loneliness in our sample was much higher than that of the two general population samples and this finding was

consistent with existing research (Badcock, Shah et al. 2015, Chrostek, Grygiel et al. 2016), it is likely that feelings of loneliness were more prevalent amongst mental health service users than in the general population. In mental health context, the severity of loneliness in our sample (M = 21.9, SD = 5.0) was comparable to adults with social anxiety disorder (M 23.68-25.07, SD 2.79-4.73) (Mazurek 2014) and adults with autism spectrum disorders (M = 20.9, SD = 4.7) (Jazaieri, Goldin et al. 2012).

A second important aim of Part I was to identify factors independently associated with loneliness at baseline among individuals with mental health problems. The relative contribution of the three sets of explanatory variables was assessed: socio-demographic, psychosocial and psychiatric variables. In the first regression model with socio-demographic characteristics as explanatory variables, only 2% of the variance in loneliness was explained and in the final model loneliness did not have significant association with any of the socio-demographics after adjusting for psychosocial and psychiatric variables (Table 8.4). This finding is consistent with previous research in people with psychosis (Badcock, Shah et al. 2015, Chrostek, Grygiel et al. 2016, Shioda, Tadaka et al. 2016), although socio-demographic characteristics were reported to affect individual differences in loneliness in studies of general population (Victor, Scambler et al. 2005, Cohen-Mansfield, Hazan et al. 2016). It is possible that the social impact of having a significant mental health problem is sufficiently severe that it overrides other socio-demographic factors which might otherwise be expected to make a difference in loneliness. The specific reasons for this phenomenon of loneliness among mental health service users warrant further exploration.

As to psychosocial variables, social network size and neighbourhood social capital were proved to be inversely related to the severity of loneliness,

explaining 18.1% of the variance in loneliness together with socio-demographic factors (Table 8.4). The finding conforms with existing studies showing that objective measures of social relations and perception of community level structures or characteristics may affect the severity of loneliness since loneliness is related to a person's social and interpersonal context (Gierveld, Keating et al. 2015, Coll-Planas, Gomez et al. 2017), although the direction of causality is not entirely clear. Lonely people may be less good at recognising community social resources, or communities with poor social capital may predispose an individual to loneliness. As the proportion of variance explained is relatively low, the findings also suggest that there are some major influences on loneliness that are not to do with social network size and neighbourhood social capital.

After adding psychiatric variables to the final regression model, the explained variance in loneliness increased to 36.2% (Table 8.4). It is surprising that having had more than five psychiatric admissions was associated with less severe loneliness. This result is contradictory to previous research which reported that a greater number of psychiatric inpatient admissions were related to more intense feelings of loneliness (Chrostek, Grygiel et al. 2016). As we explored associations between loneliness and many variables, this may be just a chance finding. Actually, the association disappeared once the adjustment for the number of years since first contact with mental health services was removed. In addition, it is understandable that longer years since first contact with mental health services were related to greater loneliness. People may get the most support when they first experience mental crisis, but mental illnesses could be chronic conditions. The support they receive may increasingly reduce and thus it is more likely for them to feel lonely. The last factor which was associated with greater loneliness was affective symptoms including indicators

of anxiety, depression, suicidality and guilt, rather than positive symptoms or negative symptoms of psychosis. In a recent research of people with psychosis, psychiatric symptoms measured by BPRS were reported to be unrelated to sense of loneliness (Chrostek, Grygiel et al. 2016). They explained that the non-significant association was due to the use of global severity of symptoms while loneliness might be associated only with some domains of psychopathology (Badcock, Shah et al. 2015). In another study adults with depressive episode were around 10 times more likely to feel lonely compared to those with no mental disorder (Meltzer, Bebbington et al. 2013), which emphasised the impact of depressive symptoms on loneliness. Masi and colleagues (Masi, Chen et al. 2011) described a regulatory loop model of loneliness, in which people who are lonely tend to have hypervigilance for social threats, keep negative social events in their memory and hold negative social expectations (Cacioppo and Hawkley 2009). These biased cognitions are likely to get people involved in behavioural confirmation processes which generate more negative social interactions and elicit further confirmation of their poor social value, and finally result in greater loneliness (Cacioppo and Hawkley 2009, Masi, Chen et al. 2011). People with depression also tend to have negative bias in thinking processes which leads to negative patterns of behaviour (Beck 1967). The two factors together with biological processes, stressors and interpersonal factors interact with one another and form a "negative downward loop" which pushes people further into depression (Schotte, Van den Bossche et al. 2006). Therefore a possible speculation is that loneliness and depression may be involved in a double feedback loop reinforcing each other (Holwerda, Deeg et al. 2016). Unexpectedly, loneliness had no relationship with participants' diagnoses in the multivariable model, although depressive/anxiety disorders, personality disorders and other disorders were associated with greater loneliness compared to psychosis in

the univariate analyses. A possible explanation is that the impact of these diagnoses on loneliness was largely due to the differences in severity of symptoms. Whereas the participants' current or most recent recorded diagnoses were collected, BPRS was applied to rate participants' present condition at interview and these current symptoms appear to have a greater effect on feelings of loneliness than long-term diagnoses.

Part Ⅱ Loneliness as a predictor of outcomes in mental disorders among CRT users: a 4-month prospective study

The four outcomes focused in the thesis are overall symptom severity, affective symptoms, self-rated recovery and health-related quality of life. The overall symptom severity derived from BPRS at both baseline (mean = 43.6, SD = 11.5) and follow-up (mean = 40.0, SD = 11.9) in our sample (Table 9.3) seemed to be less serious than inpatients of a psychiatric intensive care unit (mean = 53.1, SD = 13.3) (Dazzi, Tarsitani et al. 2017) and people with serious mental illness discharged from hospitals (mean = 53.7, SD = 11.6) (Velligan, Fredrick et al. 2017). The possible reason may be either that the CRTs were working with some less severely ill people; or that participants had already improved quite a bit from their worst point of crisis by the time we collected baseline data (no more than one month post-discharge). The score of affective symptoms at follow-up (mean = 10.8, SD = 5.3) was similar to the mean score around 9.9 of the psychiatric intensive care unit sample (Dazzi, Tarsitani et al. 2017), however it seemed to be lower than the mean score around 17.0 among outpatients with depression (Zanello, Berthoud et al. 2013) since less than 35% of our sample had a diagnosis of depressive disorders. Both the mean of the total score of self-rated recovery (mean = 56.8, SD = 15.9) (Table 9.3) and the mean of the two subscales of intrapersonal (mean = 42.9, SD = 13.9) and interpersonal (mean = 13.9, SD = 3.1) were consistent with previous

results in people with psychosis (Neil, Kilbride et al. 2009, Slade, Bird et al. 2015, Thomas, Farhall et al. 2016). The mean of the quality of life total score at 4-month follow-up (mean = 59.6, SD = 21.7) (Table 9.3) was comparable to that in adults with severe mental illness (mean 55.1-68.3, SD 16-21) (Adair, McDougall et al. 2005), and was not too different from the mean score in outpatients with depressive disorder (mean = 65.1, SD = 23.2) (Kessing, Hansen et al. 2006) and people with bipolar or schizoaffective disorder (mean = 66.5, SD = 20.1) (Subero, Berk et al. 2013).

Initially, we found that greater loneliness at baseline predicted more severe overall symptoms and affective symptoms, and poorer self-rated recovery and health-related quality of life at 4-month follow-up (Tables 9.5 – 9.8). These associations were independent of social network size and social capital, and maintained after adjusting for other potential confounders except the four outcome variables at baseline. Loneliness seems to be a better predictor of clinical outcomes and quality of life than objective social isolation, i.e. social network size and living with a partner or with family, and neighbourhood social capital. When overall symptom severity, affective symptoms and self-rated recovery were used as outcome variables in analyses, none of these psychosocial variables except loneliness predicted the outcomes in model 3 (Tables 9.5 – 9.7). In health-related quality of life, both loneliness and social network size were predictive of the outcome (Table 9.8), but the standardised regression coefficient of loneliness was larger than the coefficient of social network size (beta -0.29 vs 0.13). The results add to the conclusion of previous systematic review that subjective assessments of quality of social relationships mattered more to late-life depression than assessments of quantitative aspects of social relationships (Schwarzbach, Luppa et al. 2014).

In spite of these findings from multivariable models, however, the associations between loneliness and overall symptom severity, affective symptoms and self-rated recovery did not persist when controlling for the three outcomes at baseline (Tables 9.5 – 9.7). In overall symptoms, its scores at baseline became the only predictor of symptom severity at follow-up in the final model (Table 9.5). However, it is worth noting that the changes of these outcomes from baseline to four months were small with Cohen's *d* around 0.3 (Table 9.3) lower than recommended minimum effect size of 0.41 which represents a "practically" significant effect (Ferguson 2009). Given the small changes in outcomes from baseline to follow up, it is perhaps unsurprising that most of the variables did not remain significant when baseline outcome measure scores were included in the explanatory models. Our finding is similar to a study of people with anxiety or depressive disorders where more severe anxiety symptoms at 1-year follow-up was predicted by greater loneliness at baseline in univariate analysis but not significant when controlling for the outcome measure at baseline, although the association between loneliness and symptom severity in depression remained significant after adjustment for the outcome measure at baseline (van Beljouw, Verhaak et al. 2010). In another study of late-life depression, however, baseline loneliness remained to be a significant determinant of depressive symptom severity after two years in the fully adjusted model (Holvast, Burger et al. 2015). The inconsistency between the study results may be explained by three reasons: i) There is evidence of a strong relationship between loneliness and symptoms/recovery, but not so much evidence of the direction of the effect. Loneliness may have already had an effect on these health outcomes pre-baseline and the effect continued throughout the study period. The relationship therefore lost significance when controlling for the baseline score on the outcome measures, even though loneliness was still having an impact on health; ii) Main changes in outcomes

may have occurred pre-baseline (between CRT admission and our baseline); iii) Four months may not be long enough for the outcomes to have marked changes and thereby difficult to be explained by baseline loneliness.

In terms of health-related quality of life, baseline loneliness remained a significant predictor of poor outcome at follow-up even after controlling for baseline measure of quality of life (Table 9.8). A previous cross-sectional study among older adults with depressive symptoms found that severely lonely individuals reported poorer quality of life than not/mildly lonely people (van Beljouw, van Exel et al. 2014). However, no other studies have longitudinally investigated the association between loneliness and quality of life among people with mental health problems. Since loneliness is closely related to perceived social support, a previous longitudinal study (Fleury, Grenier et al. 2013) assessing perceived social support and quality of life among individuals with psychosis and mood disorders is relevant. Their study results showed that greater perceived social support was significantly predictive of better subjective quality of life at 18 months (Fleury, Grenier et al. 2013). The importance of subjective appraisal of social relationships was emphasised in this thesis and previous research, not least because they are closely related to quality of life among mental health service users.

Part Ⅲ The efficacy of peer-provided self-management intervention for loneliness among people leaving crisis resolution teams

The randomised controlled trial (RCT) of the CORE study provided an opportunity to take an exploratory look at whether the peer-provided, self-management intervention reduced loneliness in a large sample of people with mental health problems. As discussed in chapters 1 and 5, the main aims of the CORE intervention were to reduce relapse and improve participants'

self-management skills. However, there were also reasons to hope the intervention may be able to alleviate participants' loneliness because a good relationship with the peer support worker may help reduce loneliness and the socially-orientated goal-setting included in the self-management workbook may increase their social contact. This opportunity to explore the impact of the trial intervention on loneliness was therefore taken, as an addition to the originally planned trial evaluation. However, the hypothesis was not confirmed as no effect of the intervention on loneliness was found (Table 10.4). In fact, only loneliness at baseline was predictive of the feelings of loneliness at 4-month follow-up in the fully adjusted model.

It is of interest that the intervention had no efficacy on loneliness. This finding is consistent with a recent review where I am a co-author which suggested that there was limited evidence on the efficacy of peer support interventions on loneliness in people with mental health problems (Mann, Bone et al. 2017). The non-significant effects on loneliness found in three randomised controlled trials of peer support interventions (Chapter 5) are comparable to our finding (Dennis, Hodnett et al. 2009, Routasalo, Tilvis et al. 2009, van Gestel-Timmermans, Brouwers et al. 2012). In this thesis, it's important to note that loneliness barely changed in either group. The changes were statistically significant, but decreases of 1.6 points in the intervention group and 1.4 points in the control group from baseline to follow up are small with Cohen's *d* of 0.33 and 0.27 respectively. Considering the consistent findings with other studies, the most possible explanation could be that loneliness scores may reflect long-term difficulties with social connections/isolation which are hard to change.

Another plausible reason which may account for the failure to find the effect of peer-provided self-management intervention on loneliness is that the

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intervention was not designed to reduce loneliness in particular but to reduce relapse and promote recovery, although the hypothesis was based on the speculation that a good relationship with peer support worker and the socially-orientated goal-setting in the self-management workbook might alleviate loneliness. Some other factors may also play a role in the non-significant result. First, both the intervention and control groups received the self-management workbook. The workbook itself may have some effects on loneliness since assisting with improvement of social support and community functioning was part of its aims. Actually, the sense of loneliness was allayed from baseline to follow-up in both groups, although the effect size was small (Table 10.2). Second, it may take a longer time before social networks are developed and loneliness diminishes (van Gestel-Timmermans, Brouwers et al. 2012). The intervention was completed within three months following baseline interview. During the intervention period, peer workers might establish good relationships with participants and provide emotional or informational support, but the relationships stopped when the intervention finished. Three months may not be long enough for loneliness to change markedly, or the feelings of loneliness may have been remedied but may recur before the 4-month follow-up interview. Weiss mentioned in his book that it was whether an individual maintained the relationships that determined the sense of loneliness rather than the number of relations or the frequency of contacts within these relationships (Weiss 1973). He also termed this type of relations "supplementary relationships" which could ordinarily be furnished only for limited duration and had no linkages to the remainder of a person's social networks (Weiss 1973). Third, loneliness can be categorised into social and emotional dimensions. The peer support intervention may be effective in one dimension but not the other. Loneliness of emotional isolation, which stems from "the absence of a close emotional attachment", may be mitigated

primarily by the establishment of a single intense relationship with emotional attachment (Weiss 1973). Conversely, loneliness of social isolation, which derives from "the absence of socially integrative relationships", may be allayed mainly by access to an accepting and acceptable network (Weiss 1973). Hence, if the peer support intervention had some impact on one aspect of loneliness but not the other, the overall impact may turn out to be ineffective, although this explanation appears to be less plausible than the others.

11.2 Strengths and limitations

An important strength of the thesis concerns the measurement of loneliness in a longitudinal study among CRT users. The sample reflected a full spectrum of people with relatively severe mental health problems, which required support from mental health crisis services. The thesis offered preliminary evidence, not previously available, about the severity of loneliness and the impact of loneliness on recovery among people following mental health crises. Also, very few studies have examined the effectiveness of peer-provided self-management intervention for loneliness within high quality randomised controlled trials. The large sample size, repeated measurements, the use of well-validated instruments and standardised procedures all contributed to a greater precision of the effect estimates. Furthermore, the findings were based on rigorous statistical analyses, e.g. the outcome variables at baseline were consistently adjusted, thereby increasing precision of the findings. Linear regression provided a robust statistical comparison between the intervention and the control groups, which indicated the width of confidence intervals and the amount of variance in loneliness explained by the models. The lack of independence of participants with various peer support workers was accounted for through adjustment for clustering by peer workers. Participants in the control group were allocated as clusters of size one, i.e. one person

making up a cluster. This approach can provide more robust standard errors than regression without clustering.

However, several limitations of the thesis are worthy of note, including scope of the study, measures and analysis.

11.2.1 Scope of the study

Generalisability

A first limitation concerns the generalisability of the findings. The participants were recruited from four CRTs covering different areas in London and two CRTs in "Avon and Wiltshire" and "Surrey and Borders" and thereby may not be representative of the whole population of CRT users in the UK. Although the Trusts were selected to include inner city, suburban and more rural regions, generalisability may be limited by an overrepresentation of people from highly urbanised regions. Additionally, four types of CRT users may be underrepresented in our sample: 1) individuals who presented a high level of risk to other people since service users with aggressive tendencies or violent histories were excluded, 2) people who could not be contacted within one month of CRT discharge. These harder to reach participants may include those who were less well engaged with the CRT, or who had less access to means of communication, for example working phones, email addresses and so on, 3) individuals who could not understand English, and 4) people who were unwilling to participate in an RCT generally, or to whom the specific intervention we were offering did not appeal. This might introduce some biases that might not be there if this was a straightforward epidemiological study. Moreover, we narrowly failed to recruit at least 50% of participants with psychosis or bipolar affective disorder as we had planned, and the study sample may imperfectly reflect the diagnostic characteristics of CRT users in

general. Also, CRT service users are a particular clinical group. They include people with severe and enduring mental illness getting high levels of support from secondary mental health services and people who were not otherwise engaged with secondary mental health services before or after their CRT contact. Therefore they may not be directly comparable with populations in other studies.

Time period

The participants were assessed at baseline immediately post-crisis which is a very particular time. The examination of how loneliness relates to clinical and personal recovery immediately following a crisis is enlightening, but the relationship may be different at other points in the course of an individual's mental health problems. A person may receive more support from family and friends during crisis than the long-term recovery journey, and then the severity of loneliness may be different.

In terms of duration of follow-up, the 4-month follow-up period was not very long to identify clear longitudinal relationships. In the previous two studies where loneliness at baseline remained to be a significant predictor of depressive symptoms in the fully adjusted models, the follow-up periods were one and two years respectively and the severity of depressive symptoms between baseline and follow-up had changed markedly (van Beljouw, Verhaak et al. 2010, Holvast, Burger et al. 2015). The CORE study includes 18-month follow-up. It would be helpful to examine the longitudinal relationships between loneliness and mental health outcomes among the three time points. However the 18-month follow-up data are not available to this thesis and out of its scope.

Factors not assessed

Both loneliness and mental health may be affected by psychosocial difficulties and personal qualities that have not been taken into consideration in our study, e.g. internalised stigma, interpersonal competence, or self-esteem. Chrostek and colleagues found in a cross-sectional study that internalised stigma was the factor most closely related to loneliness among all the correlates in people with psychosis (Chrostek, Grygiel et al. 2016). Another study among people with psychotic disorders proved that loneliness was a full mediator in the relationship between internalised stigma and depressive symptoms (Switaj, Grygiel et al. 2014). Loneliness is also known to have an association with poor interpersonal competence (Chrostek, Grygiel et al. 2016). College students who were confident in their social skills were found to be more likely to choose "intimate activities" (e.g. talking to a friend) when they felt lonely, while students who had a low perceived social competence tended to choose "sensually oriented" (e.g. taking drugs) and "diversionary activities" (e.g. keeping busy) when they were lonely (Heinrich and Gullone 2006). Interpersonal competence is linked to not only loneliness but also mental health problems since severe mental illness can negatively influence people's social skills (Bradshaw and Haddock 1998). In addition, self-esteem was not assessed in our study, whereas low self-esteem is acknowledged as one of the most important cognitive characteristics of people with feelings of loneliness and a vicious circle may exist between loneliness and low self-esteem (Heinrich and Gullone 2006). Similarly, self-esteem was reported to have both direct effect on loneliness and indirect effect through support seeking in a path modeling among people with psychotic disorders (Switaj, Grygiel et al. 2015). Low self-esteem is a common feature in psychosis and plays a prominent role in the development and maintenance of psychosis

(Krabbendam, Janssen et al. 2002, Smith, Fowler et al. 2006). A meta-analysis of longitudinal studies also confirmed that low self-esteem predicted depression and anxiety (Sowislo and Orth 2013).

All the measures used in the quantitative study except the loneliness scale were preselected for the CORE trial which had different aims from the thesis. Although social network size and social capital were assessed, other psychosocial factors which were not measured may also have impact on loneliness among people with mental health problems, such as social support and community integration. Large negative correlations have been found between loneliness and perceived social support (Chapter 4). While loneliness and perceived social support are conceptually similar, they are not identical concepts. A future study assessing both factors may confirm whether the two variables have similar relationships with mental health outcomes. Community integration which consists of assimilation, support, occupation and independent living is a challenge faced by mental health service users (Townley, Miller et al. 2013). Communities where people with schizophrenia felt integrated were found to have reduced their feelings of loneliness (Shioda, Tadaka et al. 2016).

Apart from the above psychosocial factors, there is another debate about whether social relationships affect health at all times (main effects) or only when a person encounters stress or other health risks (buffering effects) (House, Umberson et al. 1988). If the buffering and main effects share the same mechanisms through which loneliness impacts on mental health, the impact may be more intense when a person confronts stress or other health risks. Alternatively, there may be a variety of mechanisms underlying buffering and main effects. A study of general population confirmed that perceived stress mediated the association between loneliness and general health (Segrin

and Passalacqua 2010). However, the evidence in mental health field is scarce and is out of the scope of this thesis.

Process of intervention

Another limitation is that it is unclear precisely whether intervention adherence and the relationship between participants and peer support workers are important factors for the effect of intervention. Castelein and colleagues conducted a randomised controlled trial of guided peer support group among people with psychosis, and reported that high attenders (≥ 9 sessions) significantly remedied social support, self-efficacy and quality of life compared with low attenders (< 9 sessions) after eight months (Castelein, Bruggeman et al. 2008). Statistical power and results interpretation can be substantially affected by low adherence to the intervention (Robiner 2005, Matsui 2009). If fewer participants receive the intervention as intended, the difference between study groups may be reduced, and any efficacy or harms of the intervention on loneliness may be underestimated (Robiner 2005). Adaptations to make the intervention fit real-world practice settings are unavoidable, however it is important to find factors that undermine intervention fidelity and to develop robust interventions which can remain effective in practice contexts (Duan, Braslow et al. 2001). For example, if loneliness in high attenders was significantly reduced compared with low attenders, the intervention sessions could be redesigned less dependent on each other and include redundant material so that patients in practice settings who skipped some sessions might still benefit from the intervention (Duan, Braslow et al. 2001). Moreover, this thesis did not include the relationship that participants had with their peer support workers. The intervention may have no effect on loneliness if their interaction with peer workers was experienced as unpleasant. In a qualitative study of change mechanisms underlying peer support interventions, "building

trusting relationships based on shared lived experience" was a key element related to change in outcomes (Gillard, Gibson et al. 2015). Also, other process-level variables were not available to test the five theories proposed by Solomon through which peer support may exert benefits, including "social support, experiential knowledge, social learning theory, social comparison theory, and helper-therapy principle". Future studies on peer support intervention may benefit from assessing factors that affect intervention adherence and exploring the ingredients that are most useful for reducing loneliness.

Process evaluation within trials "can be used to assess fidelity and quality of implementation, clarify causal mechanisms and identify contextual factors associated with variation in outcomes" (Craig, Dieppe et al. 2008). A measure of the relationship participants in the intervention group had with their peer support worker (Russinova, Rogers et al. 2013) was included as part of a planned process evaluation for the main trial. However, the data were not available for this thesis. Future evaluations of peer support interventions targeting loneliness need to offer quantitative information on key process variables such as fidelity, dose and reach, to explore whether intervention effect varies with implementation strategy, and to test hypothesised mediators e.g., therapeutic alliance with peer worker and completion of the intervention (Moore, Audrey et al. 2015). Qualitative data should also be collected and analysed iteratively to find changes in implementation, useful or adverse ingredients and unexpected causal pathways, and to further explore the emerging themes in later interviews (Moore, Audrey et al. 2015).

In terms of the match between peer support worker and service users, participants were asked if they required a peer support worker of the same gender, although the trial data officer tried to present this as "tell us if it's

essential to you" rather than "which would you like better". Apart from that, the CORE study did not attempt to do any matching, for two reasons: i) There were only teams of about four peer support workers at each site, with different capacities for how many participants they could work with at one time. If researchers had guaranteed providing a match, it would have been likely to disappoint participants. This is always likely to be a problem in routine care, where there are typically just one or two peer support workers employed in any given service, so arguably not matching makes for a better "real world" trial; ii) No evidence was found from the systematic review of peer support trials (Lloyd-Evans, Mayo-Wilson et al. 2014) that matching improved outcomes. Moreover, there was no consensus in the focus groups of the CORE study and wider consultation about whether matching is crucial or what is most important to match on, such as diagnosis, demographic characteristics, or interests. Befriending projects generally do try to match people on age, gender, interests and so forth, but have also shown little effect on loneliness (Siette, Cassidy et al. 2017). Whether matching is helpful in reducing loneliness in peer support interventions warrants exploration in future studies.

11.2.2 Measures

UCLA Loneliness Scale

First, in this thesis only a generalised sense of loneliness was considered. Social and emotional dimensions of loneliness may have different predictors and impact on mental health. Social loneliness is dominated by feelings of boredom, exclusion and marginality, while emotional loneliness is dominated by anxiety, apprehension and distress (Weiss 1973). The UCLA Loneliness Scale (both the 20-item and the 8-item scales) is a unidimensional instrument that mainly measures social loneliness, albeit with moderate loadings on

emotional loneliness and negative affect in a factor analysis of a variety of loneliness scales (Cramer and Barry 1999). The unidimensional measure of generalised sense of loneliness may complicate the interpretation of study findings, and is insufficient to explore the impact of different aspects of loneliness on mental health and which aspect the peer support intervention may influence. However, the UCLA Loneliness Scale was reported to possess solid psychometric properties (Hays and DiMatteo 1987, Russell 1996) and the highest level of internal consistency among all loneliness scales (Cramer and Barry 1999), thereby being the most widely used loneliness instrument.

Affect subscale of BPRS

The Affect subscale was derived from a meta-analysis which synthesised previous factor analyses of the 24-item BPRS and suggested core items for the four primary subscales, viz., Affect, Positive Symptoms, Negative Symptoms and Activation (Dazzi, Shafer et al. 2016). In accordance with their suggestions, the Affect subscale included four core items of anxiety, depression, suicidality, and guilt. A large number of assessment scales for mood have been developed, e.g. Patient Health Questionnaire-9 (Spitzer, Kroenke et al. 1999), Beck Depression Inventory II (Beck, Steer et al. 1996), Hamilton Rating Scale for Depression (Hamilton 1960), Montgomery–Asberg Depression Rating Scale (Montgomery and Asberg 1979) and so forth. They have been validated among psychiatric populations with good to excellent reliability and validity, and have been reported to be sensitive to change in symptom severity (Furukawa 2010). Although we didn't use a more reliable and valid instrument to measure affective symptoms, the advantages of using a multidimensional measure BPRS may be that other psychiatric symptoms can be assessed simultaneously and response burden may be decreased by controlling questionnaire length. Additionally, whereas the reliability and

validity of the Affect subscale with four items in this thesis has not been tested in other studies, the meta-analysis which defined the subscale reported that these items presented stable long-term loadings across all the original studies and defined the same dimension across the diagnostic subgroups (Dazzi, Shafer et al. 2016).

11.2.3 Analysis

Recruitment rate and follow-up rate

The recruitment rate of 23.6% of identified eligible potential participants was low and may potentially affect the generalizability of study results. The recruitment rate in our sample was comparable to that in the community mental health survey commissioned by NHS Patient Surveys (29% over three years) which was reported to be historically lower than that in other NHS Patient Survey Programmes (Care Quality (Commission 2016). However, if individuals who did not respond to the interview or who were not willing to participate in the trial were certain types of people, it can give rise to nonresponse bias, although response rates may not be a good indicator of sample representativeness and may be misleading in terms of nonresponse bias when used alone (Peytchev 2013). In a meta-analysis of correlates of nonresponse bias, no relationship was shown between response rates itself and bias across studies (Groves and Peytcheva 2008). More important, the linkage between them was based on each study measurement rather than study-specific and nonresponse bias existed especially when factors that affected study participation were measured in the survey (Groves and Peytcheva 2008). The low recruitment rate in our sample may be related to the mental health crises that the service users had just experienced before recruitment, which leads to the concern that people with severe symptoms

may disproportionately fall into the nonresponse group. Thus results should be interpreted with some caution, especially the BPRS data.

The loss to follow-up of 22.3% of participants recruited and interviewed at baseline is another limitation, although this attrition rate is comparable to that for similar study populations. For example, in previous studies, the attrition rate was 28% at 12 months in people with schizophrenia or schizoaffective disorder (Brekke, Kay et al. 2005) and 20.1% at one year among people with anxiety or depressive disorder (van Beljouw, Verhaak et al. 2010). Moreover, only housing and employment differed significantly between follow-up completers and non-completers. Participants who had independent accommodation and those who had regular employment or voluntary, protected or sheltered work were more willing to participate in the follow-up interview. However, neither of them was associated with loneliness or outcome variables in Chapter 9 (overall symptom severity, affective symptoms, self-rated recovery and health-related quality of life) in multivariable analyses.

Missingness of variables

Case mean substitution was conducted for loneliness (ULS-8), BPRS subscales, self-rated recovery (QPR) and social capital (HLSSC) at both baseline and follow-up. Case mean substitution was applied to preserve the sample size by replacing the missing items with the subject's mean score based upon the items that are present for that subject (Fox-Wasylyshyn and El-Masri 2005), whereas this method may jeopardise the variability in the data (increasing Type I error) (Newman 2014). Case mean substitution was not used for the other variables as this technique is appropriate to measures where all items or subscale items are indicators of a specific concept or construct (Fox-Wasylyshyn and El-Masri 2005) and the items are parallel and

approximately interchangeable (Newman 2014). However, listwise deletion which was applied to the rest variables may overestimate the uncertainty in data by discarding participants with missing items in the analyses (increasing Type II error) (Newman 2014). Multiple imputation (MI) which provides the appropriate level of uncertainty by repeating the imputation process multiple times is likely to generate the most accurate regression model estimates (Eekhout, de Vet et al. 2014). Although MI was recommended as the best technique for handling missing data (Eekhout, de Vet et al. 2014), it was not applied to this thesis given the very small amount of missing data in our sample. The loneliness scale (ULS-8) at follow-up was missing for 0.3% of the participants. For another 1.3% one out of eight items on the ULS-8 was missing, leading to missing values for the total score. For the ULS-8 at baseline, all the respondents completed the scale and 2.0% had 1-2 items missing. The four outcome variables of overall symptom severity (BPRS), affective symptoms (Affect subscale of BPRS), self-rated recovery (QPR) and health-related quality of life (EQ VAS) at follow-up had missing items on the scales for 2.9%, 1.6%, 2.6% and 1.9% of the respondents respectively. For the other variables the percentages of participants missing one, more, or all items ranged from 0.3-1.8%. A study of the performance of simple and advanced techniques for handling missing data reported that case mean substitution did not result in highly biased estimates when less than 25% of item scores and less than 10% of cases were missing (Eekhout, de Vet et al. 2014). In our sample, less than 3% of cases had missing data for each scale and item scores were imputed for measures with less than 25% of items absent, although cases with over 25% of missing data on a single measure had to be removed from corresponding analyses.

Method of comparison

Intention-to-treat (ITT) analysis was used when comparing follow-up loneliness between participants in the intervention group and those in the control group. ITT analysis remained all the participants who were assigned a peer support worker in the intervention group and ignored noncompliance, protocol deviations, dropout, and anything which may break the random assignment (Gupta 2011). ITT analysis reflects the potential influence of intervention policy which is comparable to the practical clinical scenario rather than the potential influence of specific intervention. It gives unbiased comparisons between groups, preserves the sample size, and minimises type I error (Gupta 2011). However, this method also embraces some limitations. To begin with, 48 participants (24%) who were assigned to the intervention group did not receive intervention at all. These individuals were included as people who received intervention, which may dilute the treatment difference and result in too conservative findings of the efficacy of the intervention (increasing Type II error) (Fergusson, Aaron et al. 2002, Gupta 2011). In addition, heterogeneity may be a problem since noncompliant, dropout and compliant participants were mixed together in the analyses, and interpretation may become tough if the proportion of crossover is large (Heritier, Gebski et al. 2003, Gupta 2011). The results would be perhaps more informative if modified ITT (mITT) could be conducted as a subgroup analysis. The mITT allows the exclusion of some participants in the intervention group in a reasonable way, e.g., people who breached the protocol or people who did not receive any intervention) (Abraha and Montedori 2010). Given the lack of evidence-based guidelines for this approach, however, the definitions of mITT in various trials were inconsistent and ambiguous, and may result in confusion and inaccurate results (Ioannidis, Evans et al. 2004, Abraha and Montedori 2010).

11.3 Implications for research

Thes thesis has implications for three main areas of research: what are the mechanisms through which loneliness may influence mental health; how can loneliness be alleviated; and how can recruitment and retention rates be maximised in trials involving mental health service users.

11.3.1 Mechanisms for loneliness affecting mental health

The thesis found a clear relationship between loneliness and health-related quality of life, and some evidence of relationships with symptoms and personal recovery, although the direction for causality has not been established. Future cohort studies over a longer period, with multiple time points may help to understand the relationship between loneliness and mental health outcomes really clearly. Additionally, studying the mechanisms through which loneliness may influence health outcomes is important to understand reasons why people feel lonely and inform the development of interventions.

House and colleagues proposed a framework for pathways of the effect of social relationships on health (House, Umberson et al. 1988). They supposed four pathways: a) social relationships ➜ health (main effects); b) social relationships ➜ biopsychosocial mediating mechanisms ➜ health (main effects with mediation); c) social relationships ➜ chronic/acute psychosocial stress ➜ health (buffering effects); d) social relationships ➜ biopsychosocial mediating mechanisms ➜ chronic/acute psychosocial stress ➜ health (buffering effects with mediation). Biopsychosocial mediating mechanisms involve biological, psychological and behavioural mechanisms. Although the framework was proposed for social relationships and support, it is also enlightening for mechanisms for loneliness in relation to health.

The effect of loneliness on health may be transmitted through biological mechanisms (Hawkley and Cacioppo 2010). Individual differences in loneliness have been confirmed to be associated with heritability (McGuire and Clifford 2000, Cacioppo, Cacioppo et al. 2014). Both genetic and environmental factors contribute to variation in loneliness in spite of different proportions they account for across ages. For example, heritability was reported to be 60% at age 7 with a decrease to 17% at age 12 among twin pairs (Boomsma, Cacioppo et al. 2007, Bartels, Cacioppo et al. 2008), while rising again to 48% in young adult and adult twins (Boomsma, Willemsen et al. 2005). It is suggested that the ability for feeling loneliness may be genetically programmed to serve adaptive functions and promote species survival from an evolutionary perspective (House, Umberson et al. 1988, Cacioppo, Cacioppo et al. 2014). A review of neurology of loneliness reported that loneliness impacts biology, human brain activation and animal brain structures and processes (Cacioppo, Capitanio et al. 2014). However the biological mechanisms which mediate loneliness and mental health are far from clear.

Loneliness may also affect health through psychological mechanisms. On the one hand, the mechanisms may have direct effect. If people obtain adequate fulfilling social interactions, they are more apt to have good psychological health since seeking social connection is an intrinsic nature of human being (House, Umberson et al. 1988). On the other hand, social relationships may change an individual's perception of social life or of stressful events. Supportive social resources to reaffirm the consistency of people's assumptions of the world and to confirm the values of themselves are crucial to psychological and physical health (Antonovsky 1979, Totman 1979). In Section 11.2.1, internalised stigma, interpersonal competence and self-esteem were mentioned as factors not assessed in this thesis, but it may be a fruitful

area for future research to study their roles in the relationship between loneliness and mental health.

Loneliness may hamper individual or collective behaviours which are able to promote health or protect people from stress or other health hazards (House, Umberson et al. 1988). Lonely people are less likely to receive support or pressure from families and friends to carry out healthy behaviours and lifestyles (e.g. adequate sleep, nonsmoking and prudent drinking), to utilise health services, and to comply with medical care (Cacioppo, Hawkey et al. 2003, Beutel, Klein et al. 2017). In House's paper, health behaviour and adaptive coping behaviour are considered as a primary mechanism connecting social support with health. However, the behavioural mechanisms linking loneliness and mental health have rarely been studied.

The mechanisms about how loneliness affects mental health are, by and large, far from clear. Researchers need to untangle whether loneliness shares the same pathways with other social relationships or possesses its specific pathways. House et al. (House, Umberson et al. 1988) suggested that "the interrelationships among multiple social, psychological, behavioural, and biological processes and mechanisms" need to be assessed and studied simultaneously to promote our knowledge of these issues. Future longitudinal studies could investigate i) biological (e.g., brain activation), psychological (e.g., internalised stigma) and/or behavioural (e.g., healthy behaviours) factors as mediation mechanisms in the association of baseline loneliness with follow-up mental health outcomes, and ii) potential stress differences in the predictive associations of baseline loneliness with mental health outcomes at follow-up. The mediation and moderation effects can also be evaluated simultaneously through structural equation modeling (January, Mason et al. 2017). Two primary effects can be investigated: a) the moderation of an

indirect effect, i.e. whether the indirect effect of loneliness on mental health outcomes through biopsychosocial factors holds across levels of a moderating variable (stress), or b) the mediation of a moderator effect, i.e. whether the mediating mechanisms can explain an interaction of loneliness and stress in predicting mental health outcomes (Fairchild and MacKinnon 2009).

11.3.2 Development of effective interventions to reduce loneliness

In this thesis, both the intervention and control groups received the self-management workbook. The effects of the workbook itself on loneliness perhaps contributed to the failure to find the efficacy of peer-provided self-management intervention on loneliness (Section 11.1 Part Ⅲ). Hence a future study could assign people to a control group which provides them with treatment as usual, or assign them to an intervention waiting list and offer them peer support after all the follow-up interviews. Also, it would be valuable if more process-level variables of the intervention were available for analysis. As a limitation stated in section 11.2.1, intervention adherence and the relationship between participants and peer support workers are consequential for the effectiveness of interventions. Although intention-to-treat analysis should be used in spite of the number of participants who adhered to the intervention, a subgroup analysis, e.g. with participants who received intervention of at least three sessions, could be used to decrease Type II error and heterogeneity of the intervention group (Section 11.2.3). In terms of the relationship between participants and their peer workers, the development of their connections may not always be satisfying since a meaningful relation relies not only on similar mental health background but also on personal characteristics and personalities (Fuhr, Salisbury et al. 2014). Furthermore, it is important to understand what psychological or psychosocial factors are affected by peer support intervention, such as social support, social skills,

hope, internalised stigma, interpersonal competence, self-esteem and self-efficacy, thereby effectively improving the intervention to mitigate loneliness.

Importantly, the CORE trial intervention was not specifically designed to diminish the severity of loneliness. It is very likely that the intervention, which focused primarily on relapse prevention and recovery facilitation, is not an effective way to reduce loneliness. It is possible that social connections were not a major focus of peer support providers' work with many participants, which led to limited effects on loneliness. Given the high prevalence of loneliness among people with mental health problems and the evidence for its harmful effect on physical health and potential impact on mental health outcomes especially on quality of life, it is important to specifically design an intervention to reduce loneliness in a robust RCT.

Mann and colleagues (including me as a co-author) (Mann, Bone et al. 2017) reviewed existing loneliness interventions in people with mental health problems. Four groups of direct interventions targeting loneliness and related concepts were described: supported socialisation or having a socially-focused supporter; social skills training and psychoeducation; changing cognitions; and wider community groups (Mann, Bone et al. 2017). Masi and colleagues (Masi, Chen et al. 2011) conducted a meta-analysis of the efficacy of some primary loneliness intervention strategies. A number of useful points are summarised below.

The first two groups of interventions can be delivered by peer support workers. Future peer support specifically targeting loneliness should guide lonely people to increase social networks and to find and attend new groups and activities, e.g. playing cards, joining a psychosocial club or a self-help group

(Perese and Wolf 2005). More important, peer workers should encourage lonely individuals to integrate into their existing social connections such as family and friends. It would also be beneficial to strengthen family ties through family meetings with the mentally ill person, or family groups with other carers who are experiencing similar family problems. These meetings could help significant persons of service users understand mental illness and its course, and learn problem-solving skills and communication skills, thereby boosting family support (Perese and Wolf 2005). Social skills training is worth considering as another helpful approach to abating loneliness among people with mental health problems, not least because their ability to establish and maintain relationships is often negatively affected by mental illness (Chapter 1). The practical information and advice such as conversational ability and interpreting body language can equip service users with better social skills which may have long-term benefit in their recovery journey (Mann, Bone et al. 2017). In short, it is crucial to help service users to establish social relationships and develop social skills that can be used after the peer support finishes as this support is only available for a limited duration and is often short of linkages to the remainder of their social connections. However, existing research did not provide a robust evidence base for these two types of interventions.

In terms of changing cognitions, the interventions focusing on maladaptive cognitions target cognitive biases and automatic negative thoughts, and endeavour to restructure social cognition and manage stress (Masi, Chen et al. 2011). In a meta-analysis of loneliness interventions, projects addressing maladaptive social cognition were more successful than other interventions focusing on social networks, social support or social skills among randomised comparison studies (Masi, Chen et al. 2011). However, the evidence base for

this type of interventions is still at its early stage. Further investigation is needed to explore the mechanisms and the best delivery mode (Mann, Bone et al. 2017).

The objective of wider community groups is to advance better community integration, mitigate stigma and improve service users' confidence as members of a wider society. A good example of the wider community groups is social prescribing. Social prescribing typically refers to: i) navigation – the process of linking support for people to access local resources; and/or ii) the process of providing subsequent community groups and activities to meet their needs (2015, Mann, Bone et al. 2017). Social prescribing provides service users the opportunity and time to discuss their issues with link workers (also known as community navigator, health advisor and health trainer). The link workers assess service users' needs, set their goals, reinforce their motivation and self-efficacy, and recommend appropriate resources and activities for them to access (2016). Ideally, social prescribing may connect health services with a very broad range of local services, including voluntary groups, social interventions, housing providers and so on (2016, Mann, Bone et al. 2017).

Although the four groups of loneliness interventions lack robust evidence of effectiveness, Mann and colleagues (Mann, Bone et al. 2017) suggested that the wider community groups may be promising future approaches. These projects can potentially raise public awareness and participation in facilitating social relationships and remedying or precluding loneliness, which may in turn create a more receptive community for people with mental health problems (Mann, Bone et al. 2017).

11.3.3 Increase of recruitment rate and follow-up rate

The increase of recruitment rate and follow-up rate can reduce the possibility of nonresponse bias and consolidate the trust in study results. However, there are some particularly challenging problems for studies including mental health service users. The Care Quality Commission (Care Quality (Commission 2016) evaluated the response rate from various subgroups in the community mental health survey, and discussed four kinds of factors primarily affecting response rate: a) Type and severity of mental health condition. People with a dual diagnosis, individuals with a cognitive impairment or dementia and those with more severe diagnoses of psychotic disorders were least likely to respond to a survey; b) Other characteristics of service users. Males, young people under 51 years, and black and minority ethnic groups had poorest response rate; c) Length of contact with services. People with long-term contact are more likely to be invited to participate in a variety of studies, thereby being more inclined to refuse; d) Trust variation. Apart from demographic and geographical difference of people who they serve, the capacity to publicise the study and encourage service users to respond differs across trusts.

Although some of these factors are not easy to change and more resources would be required for a significant improvement, Schoeni and colleagues provided some enlightening strategies to increase response rate and minimise attrition rate (Schoeni, Stafford et al. 2013). First, higher incentive payments may not only strengthen cooperation but also save fieldwork time (Lipps 2010). "Even small increases in the value of an incentive can bring a significant improvement in response rates" (Laurie and Lynn 2009). If there is no enough budget to increase payments for all the respondents, the so called "end-game" incentives may be a useful strategy to encourage the most resistant service users to participate by steadily increasing the value of incentives as the

deadline approaches (Schoeni, Stafford et al. 2013). Higher incentives could increase response rate, however bias might be introduced as they may motivate only a specific kind of participants e.g., who participate primarily due to financial payment (Hsieh, Kocielnik et al. 2016). Second, a crucial step in diminishing attrition is awareness of the whereabouts of participants. A newsletter could be sent to participants before each wave of assessment, which reminds them of the upcoming interview, offers research findings to them, and emphasises the significance of their participation. Schoeni et al. (Schoeni, Stafford et al. 2013) used directory assistance and the "United States Postal Service National Change of Address service" to keep track of participants who could not be found through recorded addresses or family members. They successfully located most of these participants and 83% of them ultimately completed interviews (Schoeni, Stafford et al. 2013). Some studies also created respondent websites to encourage participants to update their contact information and to share valuable study information and findings. Third, recontact effort should be emphasised for studies with several waves as participants who drop out at one wave may be brought back at another wave. In Schoeni's study, researchers successfully interviewed 56% of families in 2009, which took part in the study in 2005 but not 2007 (Schoeni, Stafford et al. 2013). Fourth, interviewers with preceding experience on similar surveys accomplish greater response rate than others (Schoeni, Stafford et al. 2013). The same interviewer for one participant in different waves, namely interviewer continuity, may be beneficial as well.

11.4 Implications for policy and practice

11.4.1 Awareness of loneliness

Loneliness has been identified as a prominent public health issue in existing research (Holt-Lunstad, Smith et al. 2010, Holt-Lunstad, Smith et al. 2015). There is also some evidence of loneliness as one of the circumstances that influence mental health in both immediate and long term (Chapters 1, 4, 8 and 9). It highlights the necessity of being proactive in identifying people in social need followed by adequately responding to their need. Although loneliness is common in mental health service users, it may be overlooked in clinical environment due to lack of awareness among practitioners, or due to the practitioner lacking confidence about how to meet any needs they identify, or avoiding the subject for fear it will be perceived as intrusive or upsetting by the service user. Raising practitioners' awareness of the detrimental effect of loneliness on symptoms, recovery and functioning is an imperative step which may trigger further assessment and appropriate support. Mental health nurses and other health care professionals need to be encouraged to screen for the severity of sense of loneliness to identify people at risk, given that loneliness seems to be a better predictor of clinical outcomes and quality of life than the amount of social relations (Chapter 9). The thesis also showed that individuals with severe affective symptoms or with a long history of mental illnesses were especially prone to loneliness (Chapter 8) and thus need further attention from clinicians. A validated short screening tool can potentially provide practitioners a time and cost effective approach to identify people in need. For example, the De Jong Gierveld 6-Item Loneliness Scale consists of three questions about emotional loneliness and three about social loneliness, which can give insight into different causes of loneliness (Gierveld and Van Tilburg 2006). However, the length of the scale may preclude service providers from integrating it into

existing monitoring and assessments. Another widely used tool is the UCLA 3-Item Loneliness Scale which is shorter and possesses robust psychometric property (Hughes, Waite et al. 2004). Nevertheless, the use of merely negative wording may give rise to a "response set" where people provide the same response without really thinking about what the question is, and some service users may find these negatively-worded questions too sensitive to answer (Loneliness). Generally, however, evaluation is helpful to show that practitioners are sincerely helping people who turn to the services and even a simple question asking people whether they are lonely may make an impact.

It is also important to reinforce awareness of loneliness amongst service users, their carers and the wider public. Realising the relevance of social well-being to health may motivate service users to try to change their own situation or to seek professional help. Psychoeducation towards carers can help them understand the behaviour of people who they care and the significance of their support. As a result, they may be willing to show more sympathy and provide more time to accompany the person with mental health problems, thereby remedying the person's feeling of loneliness. More important, the high prevalence of loneliness among service users is not only an individual but also a community and societal level problem, and macrosocial factors have been proposed as significant determinants of levels and content of social relationships (House, Umberson et al. 1988). Therefore it is imperative to advance public awareness of the importance of mitigating loneliness, and ultimately to urge policy level changes to support disadvantaged populations. The Campaign to End Loneliness launched in 2011 took the first steps towards diminishing loneliness and inspiring national, regional and local organisations and people to deal with its health threat in older age (Ferguson 2011). The Campaign utilises partnership approach which includes "research specialists,

think tanks, and government bodies, regional and national charities across a range of areas from older age to mental health, disability and faith groups" (Ferguson 2011). Joint projects are delivered by various groups of the organisations to raise awareness of loneliness, identify and develop effective loneliness interventions, establish a reliable lifelong network of support, and conceive a vision of a society with loneliness in older age ended (Ferguson 2011). However the Campaign is not specifically focused on mental health service users and has not been robustly evaluated. A similar collaborative approach could be conducted to inspire organisations and people to tackle loneliness issues as a mental health priority at national and local levels.

11.4.2 Strategies for combating loneliness

The thesis has shown evidence of a strong relationship between loneliness and symptoms/recovery/quality of life (Chapter 9). Although the direction of the effect needs further investigation, a marked decrease in loneliness may have positive impact on mental health service users' recovery. Therefore, in addition to screening for loneliness, practitioners should have clinical conversations with service users about the causes of loneliness and possible solutions for that individual. Although there is no robust evidence base to guide practitioners in how best to address loneliness, individualised interventions to address clients where support with loneliness is identified as a priority may nevertheless be helpful. The individualised interventions could be agreed collaboratively and reviewed regularly to check whether it's acceptable and seems to be worth persevering with. People with a long history of mental illnesses were more likely to feel lonely (Chapter 8). These people may have very limited social connections in their daily life. Practitioners could provide encouragement and guidance on how to join new groups and activities and how to be equipped with useful social skills. In order to offer them helpful

advice, practitioners should be aware of available resources. The Camerados 'Living Room' is an example which is a friendly, comfortable and animated place (e.g., a café) in Blackpool, Camden, Oxford and Sheffield (Camerados a). The living rooms are run by volunteers who have various disadvantages themselves and have been trained to support their visitors. This is a haven for anyone who feels lonely, who needs to talk to somebody, or who does not know what he or she needs rather than just for people with mental health problems. The staff believe that what all we need is friends and purpose so no one is judged there and everyone can have a conversation and get their voice heard (Camerados b). It could hopefully be a first step for mental health service users towards a sound social functioning in the community. Additionally, affective symptoms were closely related to loneliness (Chapter 8). The regulatory loop of loneliness and the negative downward loop of depression may result in a double feedback loop reinforcing each other and fall into a vicious circle (Chapter 11.1 Part Ⅰ). Under the circumstances, cognitive behavioural therapy may be most worth trying. The psychotherapy can teach lonely people to identify and tackle maladaptive cognitions and automatic negative thoughts, and thus positively affect both loneliness and affective symptoms. On balance, a personalised response to loneliness is important, considering the nature of loneliness as perceived deficiencies in one's social relationships. It is vital to have in-depth discussions with mental health service users about their circumstances, needs and wishes, and then endeavour to offer support and meet their needs.

Efforts can also be made at the policy level. Determinants of social relationships exist on multiple levels, however current loneliness interventions primarily focus on microsocial or psychological level, with less focus on macrosocial determinants of loneliness (Mann, Bone et al. 2017). For example,

the decline in fertility and mortality in our society has increased the proportion of dependent elderly people while decreased the proportion of supportive young adults. Lack of appropriate care and support for older people and of approaches to reduce stress loads on young people may be related to feelings of loneliness in both populations. Socioeconomic deprivation and inequality are also likely to result in social isolation and loneliness, and thus public policy to attenuate inequality and boost employment, education and housing opportunities may have impact on loneliness. Poverty and inequality are worldwide issues and they are associated with greater loneliness (Wen and Wang 2009, Niedzwiedz, Richardson et al. 2016), so there is a compelling case for mental health researchers and practitioners to advocate for political change to improve this. Social, political and economic improvement should be made to decrease their powerful negative effect on both people's health and its social determinants (Johnson 2017). Investment in local and national policies targeting the roots of loneliness might have a better influence on this long-term phenomenon than other short-term interventions, and might prevent chronic loneliness from being established (Mann, Bone et al. 2017). For example, cognitive behavioural therapy offered to people with employment problems may be less effective than offering them jobs with sufficient salary and satisfactory working conditions (Priebe 2015). The thesis has shown that neighbourhood social capital was associated with loneliness, so the development of more socially-connected communities with desirable facilities and support should be considered by policy makers. Local authorities' priority should be to provide accessible, affordable and safe public transport in order to increase access to health facilities, employment, amenities and so forth (Clarke 2014). Local authorities could also work collaboratively with mental health service providers to offer digital technology support such as computer training, internet access, video message, and online illness self-management.

With retirement being a usual trigger for loneliness, a project named CogniWin was designed to improve the efficiency and effectiveness of older people at work by offering a virtual "Adaptive Support and Learning Assistant" as well as well-being guidance through assistive software and monitoring hardware (Big society (Capital 2015). CogniWin aims to allow older adults to continue their employment for longer, or support them in taking on part-time or voluntary work after retirement (Big Society (Capital 2015). A variety of digital technologies specifically targeted at people with mental health problems are needed, and should be used to facilitate existing mental health care and boost social contact in their lives.

The modest impact of existing loneliness interventions implies the importance of these broader, indirect approaches which maybe more effectively change the chronic state of loneliness. The inclusion of loneliness as one of the outcomes in these policies should also be a priority (Mann, Bone et al. 2017). Failure to take into consideration the macrosocial determinants may result in overemphasis on policies which only aim at changing service users themselves (House, Umberson et al. 1988). Efforts to facilitate social relationships should be accompanied by policies that offer financial or professional support for disadvantaged citizens, which may together contribute to the mitigation of loneliness (Pilisuk and Minkler 1985).

Chapter 12: Conclusion

The main results from the two reviews and the quantitative study are summarised below:

- A conceptual model was proposed to encompass and differentiate all terms relating to social isolation and loneliness. Well-developed measures in the field of mental health were also identified.

- A systematic review found that depressed people with poorer perceived social support or greater loneliness have worse outcomes in terms of symptoms, recovery and social functioning. There is also some preliminary evidence of associations between perceived social support and outcomes in schizophrenia, bipolar disorder and anxiety disorders.

- The severity of loneliness was high among people leaving CRTs.

- More loneliness proved to be significantly associated with longer years since first contact with mental health services, and more severe affective symptoms, whereas less loneliness was associated with bigger social network size, and greater social capital.

- Loneliness at baseline was associated with all four health outcomes (overall symptom severity, affective symptoms, self-rated recovery, and health-related quality of life) at 4-month follow-up, adjusting for demographic and clinical characteristics. However this association only remained significant for health-related quality of life following adjustment for the baseline scores on the outcome measures.

- Loneliness at 4-month follow-up was not significantly different between participants in the peer-provided self-management intervention group and those in the control group.

12.1 Concept of loneliness

Loneliness, which focuses on people's emotional feeling about the adequacy or quality of their overall social relationships, differs from other social relationship concepts such as social isolation, social network, social support, social capital, confiding relationships and alienation (Chapter 2). However, some dimensions of these concepts could be closely related to loneliness including perceived social support, subjective social isolation, individual, cognitive social capital and interpersonal alienation (Chapter 2 and 3). The conceptual and methodological review in Chapter 3 proposed a conceptual model with five domains to encompass and differentiate all terms relating to loneliness. These five domains are: social network – quantity; social network – structure; social network – quality; appraisal of relationships – emotional; and appraisal of relationships – resources. Loneliness can be subsumed under the category of "appraisal of relationships – emotional" which becomes increasingly influential in mental health research.

12.2 Epidemiology of loneliness

This thesis supports a view that people with mental health problems experience increased severity of loneliness compared to the general population (Chapter 8). The quantitative investigation in Chapter 8 also highlighted the strong association between greater loneliness and more severe affective symptoms and longer years since first contact with mental health services. Moreover, less loneliness was associated with bigger social network size and greater social capital (Chapter 8). Therefore interventions targeting loneliness and mental health care professionals should pay more attention to people at particular risk of being lonely. Given the significant association between loneliness and psychosocial factors and their potential effect on the

development of loneliness, there is a need for future research to include psychosocial variables not assessed in this thesis e.g., internalised stigma, interpersonal competence, and self-esteem.

12.3 Impact of loneliness on mental health

A systematic review (Chapter 4) found preliminary evidence that greater loneliness is associated with more severe depression and anxiety symptoms and poorer remission from depression. The quantitative investigation in this thesis (Chapter 9) also found an association between greater loneliness at baseline and poorer health-related quality of life at follow-up, and that loneliness seems to be a better predictor of overall symptom severity, affective symptoms and self-rated recovery than objective social isolation and neighbourhood social capital. Concerning perceived social support – a concept closely related to loneliness, substantial evidence from prospective studies (Chapter 4) were reported that people with depression who perceive their social support as poorer have worse outcomes in terms of symptoms, recovery and social functioning. There is also some preliminary evidence of associations between perceived social support and outcomes in schizophrenia, bipolar disorder and anxiety disorders (Chapter 4). These results are congruent with a systematic review which concluded that subjective assessments of quality of social relationships appeared more closely related to depression in later life than assessments of quantitative aspects of social relationships, such as network size (Schwarzbach, Luppa et al. 2014). Together, these findings support an opinion that subjective appraisal of relationships especially feelings of loneliness could be a promising target to improve recovery for people with mental health problems. The evidence synthesised and generated by the thesis also implicates that public awareness of the health hazard posed by loneliness should be advanced, and that

practice and policy level changes should be promoted. The thesis cannot adequately explain the mechanisms about how loneliness affecting mental health. This suggests a need for future research to investigate the pathways through which loneliness exerts an influence on mental health.

12.4 Loneliness interventions

Although there is some preliminary evidence for the effect of peer support on depressive symptoms, and on self-rated recovery, quality of life, hope and empowerment in people with severe mental illness, its effect on loneliness has not previously been verified by randomised controlled trials (Chapter 5). Similarly, in this thesis the hypothesis about differences in loneliness between the peer-provided self-management intervention group and the control group was not corroborated (Chapter 10). It is in line with a recent review of loneliness interventions, which found limited evidence on the efficacy of peer support interventions on loneliness in people with mental health problems (Mann, Bone et al. 2017). However, it is noteworthy that data of intervention adherence and the relationship between participants and peer support workers were not available for this thesis, and that both the intervention and control groups received the self-management workbook (Chapter 11). These limitations encumber definite conclusions about whether peer support interventions had any effect on loneliness among people who built good relationship with their peer workers and adhered to the intervention plan. Additionally, a deficiency of process-level variables made it difficult to figure out what psychological or psychosocial factors might be affected by the peer support intervention, such as social support, social skills, hope, internalised stigma, interpersonal competence, self-esteem, self-efficacy and so forth.

Current evidence is insufficient to draw conclusions about the efficacy of peer support interventions for loneliness. Given the high prevalence of loneliness and its impact on mental health, it is necessary to specifically design a peer support intervention targeting loneliness in its own right in a high quality randomised controlled trial, which integrates multiple approaches such as increasing social networks, enhancing social support, and improving social skills. More important, wider community groups, e.g. social prescribing projects, may be a preferable next step towards better community integration. Simultaneously, broader, indirect interventions may be beneficial to macrosocial determinants of loneliness such as policies which support disadvantaged citizens.

Through literature reviews and quantitative investigation, this thesis has contributed to identifying loneliness as a useful target to improve recovery for people with mental health problems and evaluating a peer-provided self-management intervention for loneliness. This thesis thus adds value to the ultimate aim of more successfully supporting people who experience mental health crises.

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Appendix 1: Conceptualisations of social isolation and related concepts in existing literature, and their fit with our proposed domains

Table A1.1: Conceptualisations of social isolation

Reference	Attributes	Fit with proposed domains*
(Zavaleta, Samuel et al. 2014)	Internal social isolation (satisfaction with social relations, need for relatedness, loneliness, feeling of belonging to community; trust)	4, 5
	External social isolation (frequency of social contact; social network support; presence of a discussion partner; reciprocity and volunteering)	1, 3
(Nicholson 2009)	Number of contacts	1
	Feeling of belonging	4
	Fulfilling relationships	4
	Engagement with others	5
	Quality of network members	3

* Notes:

1 = Network: quantity   4 = Appraisal of relationships: emotional

2 = Network: structure   5 = Appraisal of relationships: resources

3 = Network: quality   6 = Other domains (not directly related to social isolation or loneliness)

Table A1.2: Conceptualisations of loneliness

Reference	Attributes	Fit with proposed domains*
(Hawkley and Cacioppo 2010) (Peplau and Perlman 1982) (Paloutzian and Ellison 1982)	Perceived deficiencies in quantity of one's social relationships	4
	Perceived deficiencies in quality of one's social relationships	4
(Weiss 1973)	Social-isolation loneliness (absence of an engaging social network)	4
	Emotional-isolation loneliness (absence or loss of close attachment relationships)	4
(Kearns, Whitley et al. 2015)	Feelings (feeling of being on one's own associated with not having sufficient intimate and/or other contacts, or contacts of the right type)	4
	Circumstances (an individual's social contacts and social support both in an everyday sense (who one sees, talks to, etc.) and as a latent resource (knowing who can be relied upon for help or support))	5
	Responses (a consequence of how people cope with, and respond to, their social situation)	6

* Notes:

1 = Network: quantity   4 = Appraisal of relationships: emotional

2 = Network: structure   5 = Appraisal of relationships: resources

3 = Network: quality   6 = Other domains (not directly related to social isolation or loneliness)

Table A1.3: Conceptualisations of social support

Reference	Attributes	Fit with proposed domains*
(Cohen and Wills 1985)	Structural social support (existence and form of the social network)	1, 2
	Functional social support (how the network serves to provide different kinds of support)	4, 5
(Barrera, Sandler et al. 1981)	Tangible forms of assistance (provision of goods and services)	5
	Intangible forms of assistance (guidance and expressions of esteem)	4
(Barrera 1986)	Social embeddedness (connections to significant others: measured quantitatively - either by presence or absence of indicators, e.g. married, participating in community groups etc., or through social network analysis)	1, 2
	Perceived social support (self-reported perceived availability and adequacy of supportive ties)	4
	Enacted support (reported receipt of helping activity from others)	5
(Dour, Wiley et al. 2014) (Wills and Shinar 2000)	Emotional (a resource who listens and validates)	4
	Instrumental (practical support)	5
	Informational (advice)	4, 5
	Companionate (people with whom to socialise)	4
	Feedback (feedback on community's behavioural expectations)	4

Reference	Attributes	Fit with proposed domains*
(Continued from previous page)		
(Dour, Wiley et al. 2014)	Perceived support	4
	Received support (i.e. how often supportive behaviours are received)	5
	Social integration (diversity/ number of relationships)	1, 2
(House 1981) (Cohen and Hoberman 1983) (Wills 1985)	Emotional support (caring, love and empathy)	4
	Instrumental support (tangible aid and services)	5
	Informational support (guidance or feedback that can provide a solution to a problem)	4, 5
	Appraisal support (information relevant to self-evaluation)	4
	Social companionship (spending time with others in leisure and recreational activities)	4
(Hand, Law et al. 2014) (Sherbourne and Stewart 1991)	Tangible support (same as instrumental)	5
	Affectionate support (expressing love and affection)	4
	Emotional/ Informational support (offering empathetic understanding and advice)	4, 5
	Positive social interaction support (having others to do leisure activities with)	4

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Reference	Attributes	Fit with proposed domains*
(Continued from previous page)		
(Ben-Zur, Duvdevany et al. 2014) (Kim, Sherman et al. 2008)	Emotional assistance (e.g. sympathy, care)	4
	Informative assistance (e.g. advice)	4, 5
	Instrumental assistance (e.g. financial aid or loans, help with responsibilities)	5
(Melrose, Brown et al. 2015) (Haber, Cohen et al. 2007) (Sarason, Sarason et al. 1990)	Received support (quantity of supportive behaviors received by an individual)	5
	Perceived support (both the satisfaction with support and the availability of it)	4
(Lin, Hsu et al. 2015) (Cutrona and Suhr 1994)	Action-facilitating support (informational support and tangible aid)	4, 5
	Nurturant support (emotional support and network support)	4
(Yan and Tan 2014) (Berkman, Glass et al. 2000) (Wortman and Conway 1985)	Informational support	4, 5
	Emotional support	4
	Companionship	4
	Instrumental assistance	5

* Notes:

1 = Network: quantity

2 = Network: structure

3 = Network: quality

4 = Appraisal of relationships: emotional

5 = Appraisal of relationships: resources

6 = Other domains (not directly related to social isolation or loneliness)

Table A1.4: Conceptualisations of social network

Reference	Attributes	Fit with proposed domains*
(Cohen and Sokolovsky 1978)	Morphological characteristics of networks (quantitative properties of a network: size = number of contacts; degree = average number of links each person in network has with others in the network; density = actual links between network members as a proportion of all possible links)	1, 2
	Interactional characteristics of networks (the nature of relationships: intensity = whether relationships are 'uniplex' (one function only) or 'multiplex' (more than one function); directionality = who is helping whom in a dyadic relationship)	3
(Burt 1982)	Size	1
	Density	2
	Boundedness (the degree to which they are defined by traditional structures like kin, neighbours, work)	2
	Homogeneity (how similar members are to each other)	2

* Notes:

1 = Network: quantity   4 = Appraisal of relationships: emotional

2 = Network: structure   5 = Appraisal of relationships: resources

3 = Network: quality   6 = Other domains (not directly related to social isolation or loneliness)

Table A1.5: Conceptualisations of individual social capital[†]

Reference	Attributes	Fit with proposed domains*
(Granovetter 1992) (Putnam 1995)	Structural (quantity and morphology of social contacts and social participation)	1, 2, 6
	Relational (perceived support, trust and sense of belonging derived from relationships)	4, 5, 6
(Grootaert and van Bastelaer 2002)	Structural (established roles, social networks and other structures which can facilitate information sharing and participation)	1, 2, 6
	Cognitive (shared norms, values, trust, attitudes and beliefs)	4, 5, 6
(Nahapiet and Ghoshal 1998)	Structural (quantity and morphology of social networks)	1, 2
	Relational (perceived support)	4, 5
	Cognitive (shared interpretations or systems of meaning with others (norms))	4, 6
(Putnam 1996) (Szreter and Woolcock 2004)	Bonding ("strong ties" with proximal social network, characterized by loyalty, homogeneity and exclusivity)	4, 5
	Bridging ("weak ties" with more distal social network, likely to foster social inclusion and participation)	5, 6
(Bird, Conrad et al. 2010)	Bonding	4, 5
	Bridging	5, 6
	Linking (Relationships/ties to people in formal institutions of power)	5, 6

Reference	Attributes	Fit with proposed domains*
(Continued from previous page)		
(Chen, Stanton et al. 2009)	The extent to which relationships are characterized by: Durability, Trustworthiness, Resource-rich, and Reciprocity	4, 5
(Portes 1998)	Instrumental social capital (relating specifically to the ability of someone's relationships and social connections to help them access resources: a sub-component of relational social capital)	5
(Portes 1998)	Negative social capital (e.g. exclusive in-group bonds such as gang membership may inhibit social contact with others; excessive demands from others in someone's social network)	6
(Kim and Harris 2013)	Five dimensions of social capital: Social norms, Trust, Partnership with community, Information sharing, and Participation in society	4, 5, 6,
(Frank, Davis et al. 2014)	Five dimensions of social capital: Trust, Safety, Cohesion, Engagement, and Reciprocity	4, 5, 6

† Social capital may be conceptualized as a characteristic of a community or an individual.

* Notes:

1 = Network: quantity   4 = Appraisal of relationships: emotional

2 = Network: structure   5 = Appraisal of relationships: resources

3 = Network: quality   6 = Other domains (not directly related to social isolation or loneliness)

Table A1.6: Conceptualisations of confiding relationships and related concepts

Reference	Attributes	Fit with proposed domains*
(Brown and Harris 1978)	Confiding relationship (having an intimate partner or other in whom one can confide – i.e. discuss problems and feel listened to)	3
(Langston 1994)	Capitalisation support (the extent to which a partner or other confidant provides a perceived supportive reaction to a personally meaningful event)	3
(Rook 1987)	Companionship (presence of companionate relationships within someone's social network which allow participation in activities, recreational or other, for the purpose of enjoyment (i.e. not about instrumental resources))	3
(Rusbult, Drigotas et al. 1994)	Relationship quality (The "Investment model" includes 4 aspects of intimate relationships affecting their quality: overall commitment, satisfaction, quality of alternatives, investment)	3

* Notes:

1 = Network: quantity   4 = Appraisal of relationships: emotional

2 = Network: structure   5 = Appraisal of relationships: resources

3 = Network: quality   6 = Other domains (not directly related to social isolation or loneliness)

Table A1.7: Conceptualisations of alienation

Reference	Attributes	Fit with proposed domains*
(Durkheim 1951)	Characteristic of an individual	4
	Characteristic of a society	6
(Dean 1961)	Powerlessness (separation from effective control over his economic destiny; of his helplessness; of his being used for purposes other than his own)	6
	Normlessness (purposelessnes and conflict of norms)	6
	Social isolation (feeling of separation from the group or of isolation from group standards (referring to Durkheim's concept of 'anomie'))	4, 6
(Ifeagwazi, Chukwuorji et al. 2015) (Seeman 1959, Seeman 1975) (Moszaros 1970) (Maddi 1967)	Powerlessness (the expectancy or probability held by the individual that his own behaviour cannot determine the occurrence of the outcomes, or reinforcements, he seeks)	6
	Meaninglessness (the individual is unclear as to what he ought to believe; the individual's minimal standards for clarity in decision-making are not met)	6
	Self-Estrangement (the inability of an individual to find self-rewarding or self-consummatory activities that engage him)	6
	Normlessness (high expectancy that socially unapproved behaviours are required to achieve given goals)	6
	Isolation (assign low reward value to goals or beliefs that are typically highly valued in the given society)	6

Reference	Attributes	Fit with proposed domains*
(Continued from previous page)		
(Ifeagwazi, Chukwuorji et al. 2015) (Ernst and Cacioppo 1999) (Lopez-Calva, Rigolini et al. 2012) (Citrin 1977)	Interpersonal alienation (feelings of being taken advantage of, being left out of things going on around, people around me would not do much if something happened to me, and feelings that one's personal thoughts do not matter)	4
	Political alienation (the extent of one's attachment to the ongoing political order or estrangement from society's central institutional system of government)	6
	Socio-economic alienation (poverty, limited prospects of sustainable employment, and lack of business opportunities and skills relevant to the market needs)	6

* Notes:

1 = Network: quantity   4 = Appraisal of relationships: emotional

2 = Network: structure   5 = Appraisal of relationships: resources

3 = Network: quality   6 = Other domains (not directly related to social isolation or loneliness)

Appendix 2: Multi-domain measures relating to social isolation and related concepts

Table A2.1: Multi-domain measures relating to social isolation and related concepts

Measure	Focus	Description	Psychometric properties and use
Close Persons' Questionnaire (Stansfeld and Marmot 1992)	Social support from close relationships	14-item. Three subscales: emotional and practical support and negative aspects of relationship.	Moderately good test-retest reliability and some criterion validity (moderate relationship with received social support) established Participants select and rate their most important close relationships, creating a composite score Used with general population; not validated for a mental health population
Interview Measure of Social Relationships (IMSR) (Brugha, Sturt et al. 1987)	Personal social resources	Multidimensional: size and density of the primary social network, contacts with acquaintances, adequacy of interaction and supportiveness of relationships, and crisis support.	Good inter-rater reliability, a high degree of temporal stability of close relationships, and good acceptability for use in large-scale surveys of individuals with differing social and educational backgrounds

Measure	Focus	Description	Psychometric properties and use
Adapted Social Capital Assessment Tool (A-SCAT) (Harpham, Grant et al. 2002) Short version of the Adapted Social Capital Assessment Tool (SASCAT) (De Silva, Harpham et al. 2006)	Social capital	18-item. Two dimensions: structural ('connectedness') and cognitive (reciprocity, sharing, trust). 9-item. Two dimensions: structural and cognitive social capital.	'Psychometric techniques show SASCAT to be a valid tool reflecting known constructs and displaying postulated links with other variables'; good face and content validity
Dean Alienation Scale (Dean 1961)	Alienation	24-item. Three subscales: powerlessness, normlessness and social isolation	Strong face validity, construct validity, and acceptable levels of internal consistency reliability established
Medical Outcomes Study (MOS) Social Support Scale (Sherbourne and Stewart 1991)	Social support	19-item. Four dimensions: emotional/informational, tangible, affectionate, and positive social interaction.	Reliable (all Alphas >0.91) and fairly stable over time, construct validity hypotheses supported
Social Provisions Scale (SPS) (Cutrona and Russell 1987)	Social support	24-item. Six dimensions: guidance, reassurance of worth, social integration, attachment, nurturance, and reliable alliance.	A reliable and valid measure with adequate reliabilities and construct validity
Interview Schedule for Social Interaction (ISSI) (Henderson, Duncan-Jones et al. 1980)	Social relationships	52-item. Two dimensions: availability, and adequacy.	Sufficiently valid and reliable, and also sensitive to predictable variations between sociodemographic groups, to justify its use in clinical and epidemiological studies, both in psychiatry and general medicine

Measure	Focus	Description	Psychometric properties and use
Abbreviated Duke Social Support Index (DSSI) (Koenig, Westlund et al. 1993)	Social support	23-item. Three subscales: social interaction, subjective support, and instrumental support. 11-item. Two subscales: social interaction and subjective support.	High reliability and validity, e.g. high internal consistency and correlated with hopelessness and anxiety
Interpersonal Support Evaluation List (ISEL) (Cohen and Hoberman 1983, Cohen, Mermelstein et al. 1985)	Social support	48-item. Four domains: tangible, appraisal, self-esteem, and belonging subscales. 12-item. Three subscales: appraisal, belonging, and tangible social support. 6-item. Two dimensions: emotional and tangible.	Internal consistency and test retest reliability ranging from 0.70-0.80, with moderate intercorrelation
Social Supporting Rating Scale (SSRS) (Cao, Zhang et al. 2011)	Social Support	10-item. Three dimensions: objective social support, subjective social support, and utilisation of support	Good reliability and validity
Multi-dimensional Scale of Perceived Social Support (MSPSS) (Zimet, Dahlem et al. 1988)	Social support	12-item. Three subscales: perceived support from family/friends/ significant other.	Internal consistency for the subscales was very high

Appendix 3: Search strategies for systematic review

Table A3.1: Medline

Default search limits = title and abstract (except where otherwise stated)		
#	**Search term**	**Description**
1	loneliness [MeSH]	
2	loneliness	
3	lonely	
4	(social support adj5 (subjective or personal or perceived or quality))	
5	"confiding relationship*"	
6	#1 OR #2 OR #3 OR #4 OR #5	Loneliness and related terms
7	mental disorders [MeSH]. exp	
8	mental	
9	psychiatr*	
10	schizo*	
11	psychosis	
12	psychotic	
13	depress*	
14	mania*	
15	manic	
16	(bipolar adj5 (disorder or disease or illness))	
17	anxiety disorders [MeSH]. exp	
18	#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17	Mental disorders
19	#6 AND #18	Loneliness, mental disorders
20	prognosis [MeSH]	
21	outcome*	
22	recurren*	
23	relapse	
24	admission	
25	hospitali?ation	
26	crisis	
27	admitted	
28	detained	
29	detention	
30	recovery of function [MeSH]	
31	"social functioning"	
32	"self-rated recovery"	

#	Search term	Description
33	"quality of life"	
34	"symptom severity"	
35	disability	
36	#20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35	Outcomes
37	onset	
38	first-episode	
39	incidence [MeSH]	
40	rate	
41	#37 OR #38 OR #39 OR #40	Onset
42	#36 OR #41	Outcomes/onset
43	#19 AND #42	Loneliness, mental disorders, outcomes/onset

Table A3.2: PsycINFO

Default search limits = title and abstract (except where otherwise stated)		
#	**Search term**	**Description**
1	loneliness [Subject Headings]	
2	loneliness	
3	lonely	
4	(social support adj5 (subjective or personal or perceived or quality))	
5	"confiding relationship*"	
6	#1 OR #2 OR #3 OR #4 OR #5	Loneliness and related terms
7	mental disorders [Subject Headings]. exp	
8	mental	
9	psychiatr*	
10	schizo*	
11	psychosis	
12	psychotic	
13	depress*	
14	mania*	
15	manic	
16	(bipolar adj5 (disorder or disease or illness))	
17	anxiety disorders [Subject Headings]. exp	
18	#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17	Mental disorders
19	#6 AND #18	Loneliness, mental disorders

#	Search term	Description
20	prognosis [Subject Headings]	
21	outcome*	
22	recurren*	
23	relapse	
24	admission	
25	hospitali?ation	
26	crisis	
27	admitted	
28	detained	
29	detention	
30	recovery (Disorders) [Subject Headings]	
31	"social functioning"	
32	"self-rated recovery"	
33	"quality of life"	
34	"symptom severity"	
35	disability	
36	#20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35	Outcomes
37	onset	
38	first-episode	
39	incidence	
40	rate	
41	#37 OR #38 OR #39 OR #40	Onset
42	#36 OR #41	Outcomes/onset
43	#19 AND #42	Loneliness, mental disorders, outcomes/onset

Table A3.3: Embase

Default search limits = title and abstract (except where otherwise stated)		
#	**Search term**	**Description**
1	loneliness [Subject Headings]	
2	loneliness	
3	lonely	
4	(social support adj5 (subjective or personal or perceived or quality))	
5	"confiding relationship*"	
6	#1 OR #2 OR #3 OR #4 OR #5	Loneliness and related terms
7	mental disease [Subject Headings]. exp	

8	mental	
9	psychiatr*	
10	schizo*	
11	psychosis	
12	psychotic	
13	depress*	
14	mania*	
15	manic	
16	(bipolar adj5 (disorder or disease or illness))	
17	anxiety disorder [Subject Headings]. exp	
18	#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17	Mental disorders
19	#6 AND #18	Loneliness, mental disorders
20	prognosis [Subject Headings]	
21	outcome*	
22	recurren*	
23	relapse	
24	admission	
25	hospitali?ation	
26	crisis	
27	admitted	
28	detained	
29	detention	
30	convalescence [Subject Headings]	
31	"social functioning"	
32	"self-rated recovery"	
33	"quality of life"	
34	"symptom severity"	
35	disability	
36	#20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35	Outcomes
37	onset	
38	first-episode	
39	incidence [Subject Headings]	
40	rate	
41	#37 OR #38 OR #39 OR #40	Onset
42	#36 OR #41	Outcomes/onset
43	#19 AND #42	Loneliness, mental disorders, outcomes/onset

Table A3.4: Web of Science

#	Search term	Description
	Default search limits = topic (except where otherwise stated)	
1	loneliness	
2	lonely	
3	"social support" near/5 (subjective or personal or perceived or quality)	
4	"confiding relationship*"	
5	#1 OR #2 OR #3 OR #4	Loneliness and related terms
6	mental	
7	psychiatr*	
8	schizo*	
9	psychosis	
10	psychotic	
11	depress*	
12	mania*	
13	manic	
14	bipolar near/5 (disorder or disease or illness)	
15	anxiety	
16	#6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15	Mental disorders
17	#5 AND #16	Loneliness, mental disorders
18	prognosis	
19	outcome*	
20	recurren*	
21	relapse	
22	admission	
23	hospitali?ation	
24	crisis	
25	admitted	
26	detained	
27	detention	
28	recovery	
29	"social functioning"	
30	"quality of life"	
31	"symptom severity"	
32	disability	
33	#18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32	Outcomes
34	onset	

#	Search term	Description
35	first-episode	
36	incidence	
37	rate	
38	#34 OR #35 OR #36 OR #37	Onset
39	#33 OR #38	Outcomes/onset
40	#17 AND #39	Loneliness, mental disorders, outcomes/onset

Table A3.5: Cinahl

Default search limits = title and abstract (except where otherwise stated)		
#	**Search term**	**Description**
1	loneliness [Subject Headings]	
2	loneliness	
3	lonely	
4	"social support" N5 (subjective or personal or perceived or quality)	
5	"confiding relationship*"	
6	#1 OR #2 OR #3 OR #4 OR #5	Loneliness and related terms
7	mental disorders [Subject Headings]. exp	
8	mental	
9	psychiatr*	
10	schizo*	
11	psychosis	
12	psychotic	
13	depress*	
14	mania*	
15	manic	
16	bipolar N5 (disorder or disease or illness)	
17	anxiety disorders [Subject Headings]. exp	
18	#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17	Mental disorders
19	#6 AND #18	Loneliness, mental disorders
20	prognosis [Subject Headings]	
21	outcome*	
22	recurren*	
23	relapse	
24	admission	
25	hospitali?ation	
26	crisis	

27	admitted	
28	detained	
29	detention	
30	recovery [Subject Headings]	
31	"social functioning"	
32	"self-rated recovery"	
33	"quality of life"	
34	"symptom severity"	
35	disability	
36	#20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35	Outcomes
37	onset	
38	first-episode	
39	incidence [Subject Headings]	
40	rate	
41	#37 OR #38 OR #39 OR #40	Onset
42	#36 OR #41	Outcomes/onset
43	#19 AND #42	Loneliness, mental disorders, outcomes/onset

Table A3.6: Cochrane Library

Default search limits = title, abstract and keywords (except where otherwise stated)		
#	**Search term**	**Description**
1	loneliness [MeSH]	
2	loneliness	
3	lonely	
4	"social support" near/5 (subjective or personal or perceived or quality))	
5	"confiding relationship*"	
6	#1 OR #2 OR #3 OR #4 OR #5	Loneliness and related terms
7	mental disorders [MeSH]. exp	
8	mental	
9	psychiatr*	
10	schizo*	
11	psychosis	
12	psychotic	
13	depress*	
14	mania*	

15	manic	
16	bipolar near/5 (disorder or disease or illness)	
17	anxiety disorders [MeSH]. exp	
18	#7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17	Mental disorders
19	#6 AND #18	Loneliness, mental disorders
20	prognosis [MeSH]	
21	outcome*	
22	recurren*	
23	relapse	
24	admission	
25	hospitali?ation	
26	crisis	
27	admitted	
28	detained	
29	detention	
30	recovery of function [MeSH]	
31	"social functioning"	
32	"self-rated recovery"	
33	"quality of life"	
34	"symptom severity"	
35	disability	
36	#20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35	Outcomes
37	onset	
38	first-episode	
39	incidence [MeSH]	
40	rate	
41	#37 OR #38 OR #39 OR #40	Onset
42	#36 OR #41	Outcomes/onset
43	#19 AND #42	Loneliness, mental disorders, outcomes/onset

Appendix 4: Criteria for quality assessment

The criteria for assessing study quality using the Mixed Methods Appraisal Tool (MMAT) (Pluye, Robert et al. 2011) were clarified for this review as follows:

Screening questions

- Are there clear quantitative research questions (or objectives)?

- Do the collected data allow address the research question (objective)?

If the answer is not 'Yes' to one or both screening questions, further appraisal may be not feasible or appropriate and the paper would be excluded.

Methodological quality criteria

i) Are participants (organisations) recruited in a way that minimises selection bias?

At recruitment stage: Consider whether the exposed and non-exposed groups are recruited from the same population.

ii) Are measurements appropriate (clear origin, or validity known, or standard instrument) regarding the exposure and outcomes?

At data collection stage: Consider whether (a) the variables are clearly defined and accurately measured; (b) the measurements are justified and appropriate for answering the research question; and (c) the measurements reflect what they are supposed to measure.

iii) Are the most important factors which should be adjusted for taken into account in the analysis?

At data analysis stage: Consider whether (a) demographic characteristics are adjusted for, e.g. age, gender, marital status et al.; (b) outcomes at baseline are adjusted for, e.g. symptom severity at baseline.

iv) Are there complete outcome data (80% or above), and, when applicable, an acceptable response rate (60% or above), or an acceptable follow-up

rate for cohort studies (60% or above)

Appendix 5: Studies included in systematic review

Table A5.1: **Studies included in systematic review**

Reference	Study population	Sample size	Length of follow-up period (short/medium/long term) (short = <1 year; medium = 1-2 years; long = >2 years)	Follow-up rate achieved	Predictor variable	Outcome variable	Study quality assessment rating [unmet criteria *]
Depression							
(Hybels, Pieper et al. 2016), USA	Older adults with major depression	368	Long	Not clear	Perceived social support	Trajectory class (quick recovery, slow recovery, persistent moderate, and persistent high)	** [3, 4]
(Holvast, Burger et al. 2015), the Netherlands	Older adults with major depression, dysthymia, or minor depression	378	Medium	75.4%	Loneliness	Severity and remission of depression	*** [4]
(Holma, Holma et al. 2012), Finland	Psychiatric patients with major depressive disorder	269	Long	85.1% at 6 months, 77% at 18 months, 67.7% at 5 years	Perceived social support	Disability pensions	****
(Backs-Dermott, Dobson et al. 2010), Canada	Female remitted depressed adults	90	Medium	64.4%	Perceived social support	Relapse versus stable remitted	*** [3]
(Bosworth, Voils et al. 2008), USA	Older adults with major depression	241	Medium	100%	Perceived social support	Depression severity	** [1, 4]
(Rytsala, Melartin et al. 2007), Finland	Adults with diagnosis of unipolar depression	269	Medium	77.3%	Perceived social support	Work disability allowances	*** [4]

Reference	Study population	Sample size	Length of follow-up period (short/medium/long term) (short = <1 year; medium = 1-2 years; long = >2 years)	Follow-up rate achieved	Predictor variable	Outcome variable	Study quality assessment rating [unmet criteria *]
(Continued from previous page)							
(Rytsala, Melartin et al. 2006), Finland	Psychiatric patients with unipolar depression	269	Medium	87%	Perceived social support	Functional disability, social and work adjustment, and days spent ill in bed or not	*** [4]
(Leskela, Rytsala et al. 2006), Finland	Adults with major depressive disorder	269	Medium	85.1% at 6 months, 76.9% at 18 months	Perceived social support	Severity of depression	****
(Steffens, Pieper et al. 2005), USA	Older adults with major depression	204	Long	Not clear	Perceived social support	Severity of depression	** [1, 4]
(Ezquiaga, Garcia-Lopez et al. 2004), Spain	Adults with unipolar major depression	72	Medium	79.2%	Perceived social support	Episode remission	** [3, 4]
(Gasto, Navarro et al. 2003), Spain	Elderly patients with unipolar major depression	108	Short	Not clear	Perceived social support	Severity of residual symptoms	** [3, 4]
(Bosworth, McQuoid et al. 2002), USA	Older adults with major depression	239	Long	86.5%	Perceived social support	Time-to-remission	*** [4]
(Bosworth, Hays et al. 2002), USA	Older adults with major depression	301	Medium	84.6%	Perceived social support	Remission	*** [4]
(Triesch 2002), USA	Adults with major depressive disorder	66	Short	68.0%	Perceived social support	Severity of depressive symptoms, and quality of life	*** [4]

Reference	Study population	Sample size	Length of follow-up period (short/medium/long term) (short = <1 year; medium = 1-2 years; long = >2 years)	Follow-up rate achieved	Predictor variable	Outcome variable	Study quality assessment rating [unmet criteria *]
(Continued from previous page)							
(Hays, Steffens et al. 2001), USA	Older adults with major depression	159	Medium	Not clear	Perceived social support	Activities of daily living	*** [4]
(Oxman and Hull 2001), USA	Older adults with dysthymia or minor depression	415	Short	74.0%	Perceived social support	Depression severity	*** [4]
(Brummett, Barefoot et al. 2000), USA	Older adults with major depression	115	Medium	94.8% at 6 months, 76.5% at 1 year	Perceived social support	Depressive symptoms	** [1, 4]
(Sherbourne, Hays et al. 1995), USA	Patients with depression/depressive symptoms	604	Medium	62%	Perceived social support	Number of depressive symptoms	** [2, 4]
(Blazer, Hughes et al. 1992), USA	Adults with depression	118	Medium	98%	Perceived social support	Decreased life satisfaction symptoms, and endogenous symptoms	****
(Blazer and Hughes 1991), USA	Patients with depression	125	Medium	Not clear	Perceived social support	Depressive symptoms	** [3, 4]
(Brugha, Bebbington et al. 1990), UK	Adults with depression	130	Short	92%	Perceived social support	Symptom severity	****
(George, Blazer et al. 1989), USA	Middle-aged and elderly depressed in-patients	150	Long	100%	Perceived social support	Depressive symptoms	*** [1]
(Krantz and Moos 1988), USA	Patients with major or minor depression	424	Medium	98.8%	Perceived social support	Remitted, partially remitted, and nonremitted	*** [3]

Reference	Study population	Sample size	Length of follow-up period (short/medium/long term) (short = <1 year; medium = 1-2 years; long = >2 years)	Follow-up rate achieved	Predictor variable	Outcome variable	Study quality assessment rating [unmet criteria *]
(Continued from previous page)							
Schizophrenia/schizoaffective disorders							
(Ritsner, Gibel et al. 2006), Israel	Inpatients with schizophrenia/schizoaffective disorders	148	Medium	100%	Perceived social support	Quality of life	*** [3]
(Brekke, Kay et al. 2005), USA	Adults with schizophrenia/schizoaffective disorders	139	Medium	71.9%	Perceived social support	Global functional outcome (work, social functioning, and independent living), and social functioning domain	** [3, 4]
Bipolar disorder							
(Koenders, Giltay et al. 2015), the Netherland	Bipolar I and II outpatients	173	Medium	71.1%	Perceived social support	Symptoms severity, and functional impairment	*** [4]
(Cohen, Hammen et al. 2004), USA	Remitted patients with prior diagnosis of bipolar I disorder	52	Medium	100%	Perceived social support	Recurrence	** [3, 4]
(Daniels 2000), USA	Adults with diagnosis of bipolar disorder	42	Short	95.2%	Perceived social support	Depressive symptomatology, manic symptomatology, and functional impairment	*** [1]
(Johnson, Winett et al. 1999), USA	Adults with diagnosis of bipolar disorder	59	Medium	77.6%	Perceived social support	Time to recovery, severity of manic and depressive symptoms	** [1, 4]

Reference	Study population	Sample size	Length of follow-up period (short/medium/long term) (short = <1 year; medium = 1-2 years; long = >2 years)	Follow-up rate achieved	Predictor variable	Outcome variable	Study quality assessment rating [unmet criteria *]
(Continued from previous page)							
Anxiety disorders							
(Jakubovski and Bloch 2016), USA	Patients with diagnosis of generalized anxiety disorder, panic disorder, social anxiety disorder or post-traumatic stress disorder	1004	Short	Not clear	Perceived social support	Remission, and response (a reduction of at least 40% symptoms at 6 months)	*** [4]
(Shrestha, Stanley et al. 2015), USA	Older adults with generalised anxiety disorder	134	Medium	Not clear	Perceived social support	Quality of life	** [3, 4]
(Dour, Wiley et al. 2014), USA	Adults with diagnoses of panic, generalized anxiety, social anxiety, and/or posttraumatic stress disorder	1004	Medium	87% at 6 months, 81% at 12 months, and 80% at 18 months	Perceived social support	Anxiety symptoms, and depressive symptoms	****

Reference	Study population	Sample size	Length of follow-up period (short/medium/long term) (short = <1 year; medium = 1-2 years; long = >2 years)	Follow-up rate achieved	Predictor variable	Outcome variable	Study quality assessment rating [unmet criteria *]
(Continued from previous page)							
Mixed samples with various mental health problems							
(Fleury, Grenier et al. 2013), Canada	Individuals with severe mental disorders according to the DSM-IV – schizophrenia and other psychotic disorders, or mood disorders	352	Medium	84.4%	Perceived social support	Subjective quality of life (satisfaction with life domains)	** [3, 4]
(van Beljouw, Verhaak et al. 2010), the Netherlands	People with anxiety or depressive disorder	743	Medium	79.9%	Loneliness	Severity of depression and anxiety	*** [4]

* Quality criteria: 1 = selection bias; 2 = measurement quality; 3 = adjustment of confounders; 4 = percentage of complete outcome data/response rate/follow-up rate

Appendix 6: Chapter 3 literature review: published paper

Social isolation in mental health:

a conceptual and methodological review

Article published in NIHR School for Social Care Research

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SOCIAL ISOLATION IN MENTAL HEALTH:

A CONCEPTUAL AND METHODOLOGICAL REVIEW

SCOPING REVIEW 14

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The School for Social Care Research was set up by the National Institute for Health Research (NIHR) to develop and improve the evidence base for adult social care practice in England in 2009. It conducts and commissions high-quality research.

About the authors

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Contents

Abstract

Social isolation and related terms such as loneliness have been increasingly discussed in the field of mental health. However, there is a lack of conceptual clarity and consistency of measurement of these terms and understanding of overlaps.

This scoping review aims to provide a clear conceptual framework for social isolation and related terms, and to propose well established measures in the field of mental health for each conceptual domain.

The review used an iterative strategy of expert consultation and literature searching, following an established process for conceptual reviews. A multidisciplinary group of senior academics was consulted both before and after literature searching to identify relevant terms, conceptual papers or recommended measures. We searched the Web of Science database using terms suggested by experts and then identified further relevant studies through review articles and through reading full text or reference lists of included studies. A narrative synthesis was conducted.

This report provides definitions and brief explanations of relevant conceptual terms from the literature, and proposed a conceptual model with five domains to include all elements of current conceptualisations. These five domains are:

- social network: quantity
- social network: structure
- social network: quality
- appraisal of relationships: emotional
- appraisal of relationships: resources

It also identified some well-developed measures suitable for assessing each of the five conceptual domains or covering multi-domains. We discuss the strengths and limitations of our approach.

The review proposes a conceptual model to distinguish and fit all concepts relating to social isolation. The developed model can help researchers and intervention developers to identify expected outcomes of interventions precisely and choose the most appropriate measures for use in mental health settings.

Keywords

to follow

Acknowledgements

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Introduction

There has been a realisation among policymakers and social care and health practitioners that social relations play an influential role in mental health and psychological wellbeing (Andersson 1998). People with mental illness living in the community often say they feel socially isolated and lonely (DeNiro 1995, Davidson *et al.* 2004, Herman *et al.* 2005, Perese and Wolf 2005, Chernomas *et al.* 2008).

Feelings of loneliness are worse and social network size is smaller among mental health service users than in the general population (Clinton *et al.* 1998, Borge *et al.* 1999, Lauder *et al.* 2004, Palumbo *et al.* 2015). Previous studies report loneliness to be related to personality disorders and psychoses (Richman and Sokolove 1992, Neeleman and Power 1994, DeNiro 1995), suicide (Goldsmith *et al.* 2002), and more severe depressive symptoms (Segrin 1999, Heikkinen and Kauppinen 2004, Wei *et al.* 2005, Cacioppo *et al.* 2006, Luanaigh and Lawlor 2008). Similarly, Schwarzbach and colleagues (2014) have identified in a systematic review that poor social support and quality of relations, and lack of confidants were significantly associated with depression. In the context of severe mental illness, social isolation has been linked to higher levels of delusions (Garety *et al.* 2001), lack of insight (White *et al.* 2000) and high hospital usage (Mgutshini 2010). Conversely, people who received more social support from friends and family were more likely to recover from psychotic symptoms (Calsyn and Winter 2002).

However, there is a lack of clarity about definitions of social isolation, loneliness and related concepts, and how they should be measured (Windle *et al.* 2011, Courtin and Knapp 2015). Definitions of social isolation encompass, and sometimes merge, the objective degree of social contact an individual has with others and the subjective experience of the adequacy of that contact. Nicholson (2009) for example, defines social isolation as 'a state in which the individual lacks a sense of belonging socially, lacks engagement with others, has a minimal number of social contacts and they are deficient in fulfilling quality relationships'. While social isolation has been linked to loneliness, it is not synonymous (Wenger *et al.* 1996, Andersson 1998). Social isolation can be objectively measured in terms of social network size and/or frequency of contact with others (Wenger *et al.* 1996) while emotional loneliness can only be described – subjectively – by a person him/herself (Andersson 1998). A consensus on the definition of loneliness has not been reached (Bekhet *et al.* 2008) and several measures of loneliness and social isolation have been developed (Cramer and Barry 1999). These, and related terms, e.g. social networks, confiding relationships, social support, are all contested concepts, with multiple meanings. Researchers sometimes use these terms loosely and interchangeably because it is unclear how different these concepts differ or overlap (Valtorta *et al.* 2016). For example, in research studying the course of psychiatric illness, loneliness and social isolation were measured by only one item and analysed and reported simultaneously as a phrase 'loneliness/social isolation' (Hansson *et al.* 1994).

This review focused entirely on social relations as they are experienced/can be measured at the level of individuals, but of course there is a higher order sociological approach to looking at how people relate to each other within a society, and individual relationships will always be within this context. For example, social isolation and related concepts, which focus on individuals' connectedness, companionship and contact with others, may be distinguished from concepts such as ecological social capital (which relate to the quality of social relationships within a community in general) and from concepts such as social inclusion (which relates to individuals' access to resources and participation in economic, political and social activity, rather than the number or quality of their interpersonal relationships). Previous reviews have provided an overview of the current conceptual and methodological literature on social exclusion (Morgan *et al.* 2007, Wright and Stickley 2013) and social capital (Harpham *et al.* 2002, Bhandari and Yasunobu 2009). While there are conceptual reviews of specific concepts relevant to social isolation and loneliness (Wenger *et al.* 1996, de Jong Gierveld *et al.* 2006, Zavaleta *et al.* 2014), to our knowledge, no review has explored the full range of concepts relating to social isolation and related terms and how they are used in the field of mental health. In this field, where numerous conceptual terms

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with contested definitions are used, our review can therefore help address the lack of conceptual clarity and consistency of measurement which hampers attempts to synthesise findings about the effectiveness of interventions to reduce social isolation, or its impact on other outcomes (Windle et al. 2011, Courtin and Knapp 2015).

The aim of this review is to provide a clear conceptual framework for social isolation and related terms, and examples of different measurement approaches for each concept and most well established measures in the field of mental health (focusing on mental illness and populations of mental health service users, rather than the fields of wellbeing or mental health promotion). It will be of value in helping future researchers decide exactly what they want to measure and how to go about it.

Method

Overall approach

Conceptual and methodological reviews differ from systematic reviews of effects. Systematic reviews predefine precise criteria to capture a discrete body of evidence, while the exact scope and nature of conceptual reviews is established through the process of conducting the review and thus clarifying relevant concepts. Practical challenges for conceptual reviews include: difficulties in maintaining pre-planned search strategies; implicit weighting of studies' merits or relevance; iteration of the process; and problems of forming straightforward conclusions and recommendations (Lilford *et al.* 2001). Lilford and colleagues (2001) offer recommendations for conduct of methodological research to minimise bias and facilitate efficient management of research. We followed these recommendations and used an iterative and consultative process to achieve a clear, conceptual understanding of social isolation and related terms. This process included searching widely using disparate databases and sources, making sure that the review is informed by expert advice (including in this case social science, psychological and medical perspectives) and allowing some overlap in the various stages of the review process so that the final nature and scope of the review can be clarified in response to interim findings and feedback.

Literature search

The iterative search strategy involved:

Expert consultation: First, we consulted a multidisciplinary group of senior academics familiar with this field (a London social psychiatry group) to identify relevant terms (e.g. social networks, loneliness, confiding relationships, social support). Following initial literature searching, we extracted data which informed our development of a draft conceptual map with several domains to fit in all identified relevant terms. Then we consulted this same group and contacted 15 international experts identified through initial literature searching, to present our draft conceptual map and seek feedback and suggestions for any additional relevant terms, conceptual papers or recommended measures. These international experts specialise in the concepts identified by our first consultation and have conducted numerous relevant studies outside the mental health field, including social neuroscience, sociology, social psychology, social and behavioural research, social policy, and public health sciences.

Literature search: Using terms suggested by experts, we searched the Web of Science database on 23 April 2015 for papers which proposed definitions of social isolation and related terms, or the methods of measurement of these concepts. Search terms for social isolation and related terms (social isolation OR loneliness OR social network* OR social support OR confiding OR confide OR social contact* OR social relation* OR social capital) were combined with terms for mental disorders (mental OR psychiatr* OR schizo* OR psychosis OR psychotic OR depress*, mania* OR manic OR bipolar near/5 (disorder or disease or illness) OR anxiety). Time limits for the initial search were restricted to 1 January 2013 to 23 April 2015 as a high volume of articles was retrieved initially. Web of Science was selected as an inter-disciplinary database covering a wide range of subject areas, including Science Citation Index Expanded and Social Sciences Citation Index. Reference lists of studies identified through the electronic search for inclusion in the review and of review articles were then hand-searched for other relevant studies, without time limit. Wherever a paper retrieved for full-text screening referred to another potentially relevant study, this too was retrieved and screened: in this way we retrieved older literature in addition to the recent papers included in our time-limited search.

Studies were included from the initial electronic database search which met two criteria: they proposed a definition or measure of a concept relating to social isolation; and the concept or

measure had been applied in the field of mental health, relating to adults with mental illness. Studies of children under 16 years old, or populations with learning disabilities and organic disorders were excluded. Studies with no explicit definition of social isolation and related terms or studies not using well-developed measures of these terms, e.g. studies using single-item measures, were excluded. Where relevant concepts or measures used in a mental health context had originally been developed in other fields, the original source was additionally retrieved and reviewed.

Data extraction and synthesis

We extracted information on definitions of social isolation and related terms, and on approaches to its measurement, using an electronic data extraction form developed for this review. From papers reporting relevant measures, we recorded: name of the measure, reference, concept measured, description (items or subscales), psychometric properties established, and studies using this measure. Wherever additional papers referred to relevant conceptual definitions or measures already identified through our search, these additional papers were noted in our data extraction form. Initial screening was conducted by single review authors (JW, BLE, RF, CN, FM), with regular meetings between review authors to address uncertainties about inclusion where necessary and check that a consistent approach to screening was applied.

A narrative approach was adopted to synthesise the findings, comprising three stages.

1. With reference to the retrieved definitions of relevant terms, the review authors developed a set of conceptual domains which covered all the elements within conceptualisations of social isolation and related terms from the included papers.

2. The validity of the conceptual framework provided by this set of domains was then assessed with reference to existing literature. All included conceptual papers from the literature search were cross-referenced with the domains we developed, to check whether our conceptual map was sufficiently comprehensive to include all relevant concepts and was not adding additional domains not covered in the literature. (A record of the retrieved concepts we reviewed and how we mapped them to the domains of our conceptual framework is provided in Appendix 1).

3. Measures of social isolation and related terms identified from our literature search were reviewed by the authors and best examples of suitable measures for each of our proposed conceptual domains were identified. For each domain, measures, regardless of their length, with established good psychometric properties and demonstrated applicability and wide use in mental health settings were prioritised and thus identified as most suitable measures. Initial selection of appropriate measures was undertaken by single review authors (JW, BLE, RF, CN, FM); review authors met to agree the final selection of measures included in this review based on the two criteria above.

Further consultation with experts was conducted to improve and validate the conceptual model and to identify any further relevant literature or concepts not included. We persisted in this process until no new concepts or measurement methods were emerging.

Results

In our electronic database search, 5,437 papers were identified (Figure 1). This number was reduced to 958 potentially eligible papers by reading titles and abstracts. After full text screening, we excluded 609 papers because they were studies of children under 16 years old, about learning disabilities/organic disorders, had no concepts/measures of interest, were not about mental illness, or lacked well-developed measures. A further 353 studies were identified from reference lists of papers included and review articles. Therefore, 702 papers were finally included in our review. Of these, 277 papers discussed concepts relating to social isolation and related terms with 162 papers identified from reference lists. These 277 included multiple papers describing the same, or conceptually similar definitions of terms. We also retrieved 425 papers presenting measures of relevant concepts with 191 original papers which developed or adapted these measures. Of these, we have reported 16 in our review, those which have been most widely used in the field of mental health and/or have the best established psychometric properties.

Figure 1. Search strategy
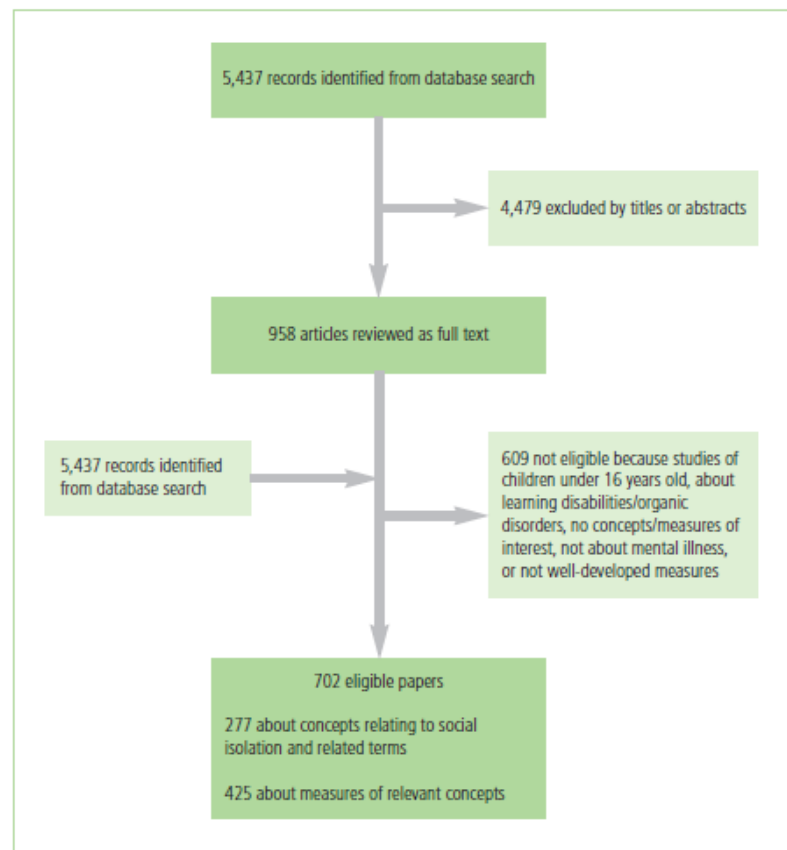
Definitions and brief explanation of relevant conceptual terms

The conceptual map of social isolation and related terms was informed by definitions of concepts identified in our search of the literature. In this section we summarise how social isolation and related terms have previously been conceptualised. These concepts have been widely cited in mental health research although not all of them originated in the field of mental health. We traced the original definitions of these concepts through the reference lists of included studies.

Social isolation

Nicholson (2009) undertook an evolutionary concept analysis to identify the definition and attributes of social isolation as experienced by older adults. Five aspects of social isolation were proposed – 'number of contacts, feeling of belonging, fulfilling relationships, engagement with others, and quality of network members' (ibid.).

Zavaleta and colleagues (2014), in a review of social isolation not specific to a mental health context, defined social isolation as 'the inadequate quality and quantity of social relations with other people at the different levels where human interaction takes place (individual, group, community and the larger social environment)'. They distinguished two domains of social isolation: external and internal characteristics. External characteristics, also known as objective social isolation, refer to observable social contacts – having few or no meaningful relationships with others (de Jong Gierveld et al. 2006, Zavaleta et al. 2014). Conversely, internal characteristics, also labelled as subjective social isolation, refer to personal attitudes not quantifiable by observation, such as trust, satisfaction with relationships and loneliness (Zavaleta et al. 2014). The Nicholson and Zavaleta models of social isolation both include objective social contact and subjective perceived adequacy of contact within one overarching construct of social isolation.

Warren (1993) proposed four criteria relating to the quality of someone's social environment and relationships as essential ingredients of social isolation: stigmatised environment (an individual being negatively appraised as different from other people because of appearance, behaviour or tribe), societal indifference, personal-societal disconnection, and personal powerlessness (Warren 1993).

Loneliness

Loneliness can be construed as a painful emotional state that occurs when there is 'a discrepancy between…the desired and achieved patterns of social interaction' (Peplau and Perlman 1982, Goosby et al. 2013, Zavaleta et al. 2014). Bekhet and colleagues (2008) summarised three common assumptions from various definitions of loneliness: perceived deficiencies in one's social relationships; a subjective state, different from the objective state of social isolation; and an unpleasant and distressing experience. Loneliness can be regarded as multifaceted.

Another often cited definition of loneliness is a state of negative affectivity accompanying the perception that one's social needs are not being met by the quantity or especially the quality of one's social relationships (Peplau and Perlman 1982, Wheeler et al. 1983, Pinquart and Sorensen 2001, Hawkley et al. 2008).

Weiss (1974) also proposed a multidimensional concept of loneliness, categorising loneliness into social or emotional dimensions. Social loneliness derived from inadequate engaging social networks, while emotional loneliness stemmed from the absence of intimate attachment relationships. Based on this categorisation, Weiss (Weiss 1974) conceived a model of loneliness with six components – attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity for nurturance. These components were claimed to be necessary in order to avoid loneliness (Weiss 1974).

Social support

Two main conceptualisations of social support have been distinguished: functional and structural (Sanchez Moreno 2004). The structural perspective emphasises the existence, quantity, and properties of an individual's social relations (ibid.). The functional viewpoint attempts to determine which functions are fulfilled by the person's social relations (ibid.). The functions most often cited are: emotional support (which involves caring, love and empathy), instrumental support (referred to by many as tangible support), informational support (which consists of information, guidance or feedback that can provide a solution to a problem), appraisal support (which involves information relevant to self-evaluation) and social companionship (which involves spending time with others in leisure and recreational activities) (House 1981; Cohen and Hoberman 1983; Wills 1985). Many measures of social support assess three components, spanning both structural and functional domains: social network and social integration variables (diversity/number of relationships), received support (how often supportive behaviours are received) and perceived support (support the person believes to be available if he or she should need it) (Hupcey 1998; Dour *et al.* 2014). Cobb (1979) proposes the mutuality of obligation in relations with others, as well as the functional support received by an individual from others, as a component of social support.

Social network

Social network refers to 'a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behaviour of the persons involved' (Mitchell 1969). Social network analysis can measure 'morphological' and 'interactional' characteristics of networks (Cohen and Sokolovsky 1978). Morphological characteristics refer to quantitative properties of a network. They include size (number of contacts), degree (average number of links each person in network has with others in the network), and density (actual links between network members as a proportion of all possible links) (Cohen and Sokolovsky 1978). Interactional characteristics refer to the nature of relationships. They include intensity: whether relationships are 'uniplex' (one function only) or 'multiplex' (more than one function) and directionality: who is helping whom in a dyadic relationship (Cohen and Sokolovsky 1978).

Social capital

Social capital is generally understood as 'a series of resources that individuals earn as a result of their membership in social networks, and the features of those networks that facilitate individual or collective actions' (Portes 1998, Putnam 2000, McKenzie *et al.* 2002). The widely used definition of social capital in health sciences originates with Putnam (Putnam 2000, De Silva *et al.* 2005). By analogy with concepts of physical capital and human capital (tools and training that improve individual productivity), social capital refers to 'features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit' (Putnam 2000). The concept of social capital emphasises multiple dimensions. It can be divided into a behavioural/activity component (structural social capital) and a cognitive/perceptual component (cognitive social capital) (Bain and Hicks 1998, De Silva *et al.* 2005). Five dimensions of social capital have been proposed: social norms, trust, partnership with the community, information sharing, and political participation (Kim and Harris 2013).

In addition, social capital has both an individual and a collective aspect – a private and a public face (Putnam 1999). It can be considered a property of communities (an ecological construct) or of individuals. Individual social capital is most commonly measured by asking individuals about their participation in social relationships (for example, membership of groups) and their perceptions of the quality of those relationships. Two components of social capital have also been proposed (Siegler 2015): 'Bonding' social capital describes closer connections between people with a family connection or shared group identity, and is typically the source of most of an individual's emotional and instrumental social support. 'Bridging' social capital describes more distant connections between people not directly linked to friends or family, with distinctions or distance between them

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– for example people from different classes or ethnic communities. This distinction mirrors that made by Granovetter (1973) between 'strong ties' and 'weak ties' with others in a person's social network.

Confiding relationship

Measures of confiding relationship rate the degree of closeness and intimacy someone has with other people (Brown and Harris 1978 Murphy 1982). For example, intimate relationships with a spouse, or with a friend who was seen on a regular basis and could be relied on to give advice, were considered 'good confidant', while 'poor or no confidant' refers to conflicted relationships with a spouse, an unsteady relationship or no one to confide in at all (Emmerson et al. 1989). Since their seminal 1978 paper on the social origins of depression, which established the lack of a confiding relationship as a risk factor for depression, Brown and Harris have emphasised the desirability of separating out the degree of confiding in a relationship (which may be influenced by both parties' attachment style and perception of the other) and the active emotional support given by a confidant (Brown et al. 1986). This mirrors the distinction between perceived and received support in the social support literature.

Alienation

Bronfenbrenner (1979) defined alienation as 'the feeling of disconnectedness from social settings such that the individual views his/her relationships from social contexts as no longer tenable'. Five basic ways where the concept of alienation has been used have been discussed by Marxist and existentialist scholars (Seeman 1959, Maddi 1967, Moszaros 1970, Seeman 1975): powerlessness, meaninglessness, normlessness, isolation and self-estrangement. Powerlessness originated in the Marxian view that the worker in a capitalist society 'is alienated to the extent that the prerogative and means of decision are expropriated by the ruling entrepreneurs' (Seeman 1959). In Seeman's paper, powerlessness can be conceived beyond the industrial sphere as 'the expectancy or probability held by the individual that his own behavior cannot determine the occurrence of the outcomes, or reinforcements, he seeks'. Meaninglessness refers to lack of understanding of the events in which an individual is involved, especially 'when the individual's minimal standards for clarity in decision-making are not met' (ibid). Normlessness is derived from Durkheim's concept of anomie (Durkheim 1997 [1897]). Seeman (1959) defined an anomic situation as one where there is a 'high expectancy that socially unapproved behaviors are required to achieve given goals'. Isolation is related to reward values in terms of alienation. Isolated people 'assign low reward value to goals or beliefs that are typically highly valued in the given society' (ibid). Self-estrangement refers to the inability of an individual to obtain self-rewarding or self-consummatory activities (ibid).

Dean (1961), however, considered alienation as having three main components: powerlessness, normlessness and social isolation. The last component was conceived as part of Durkheim's concept of anomie – 'a feeling of separation from the group or of isolation from group standards' (ibid). Dean also constructed a 24-item scale to measure these three components (ibid).

In the study by Ifeagwazi and colleagues (2015), emphasis was placed on interpersonal, political and socioeconomic domains of perceived alienation. Interpersonal alienation has been associated with social isolation, loneliness and feelings of distrust (Ernst and Cacioppo 1999). The indicators of interpersonal alienation have been reported to include feelings that one's thoughts do not count, feelings of being left out, of being taken advantage of, and receiving no help if something happened (Lopez-Calva et al. 2012). Political alienation and socioeconomic alienation refer to perceived estrangement from the salient objects in the political domain and from socioeconomic activities respectively (Ifeagwazi et al. 2015). Among the above domains, interpersonal alienation is of most relevance to our review, with conceptual overlap with definitions of social isolation and social support.

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A conceptual model of social isolation and related terms

The above review of conceptual definitions identified through literature searching and analysis enabled us to generate a draft conceptual model of social isolation and related terms. After repeatedly consulting experts and checking the match of the concepts identified with our model, five conceptual domains were proposed which are sufficiently comprehensive to include all elements of current conceptualisations. These five domains are:

- social network: quantity
- social network: structure
- social network: quality
- appraisal of relationships: emotional
- appraisal of relationships: resources

Table 1 summarises how these five domains map on to existing conceptual terms.

Table 1. Social isolation and related concepts: conceptual framework

Established concepts relating to social isolation or loneliness	Domains included in existing concepts relating to social isolation or loneliness					
	Network:			Appraisal of relationships:		Other domains (not directly related to social isolation or loneliness)
	quantity	structure	quality	emotional	resources	
Social isolation	×		×	×	×	
Loneliness				×		
Social support	×	×		×	×	
Social network	×	×	×			
Social capital (individual)				×	×	Ecological social capital Negative social capital
Confiding relationships and related concepts			×			Negative aspects of relationships
Alienation				×		Powerlessness, normlessness

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Appendix 1 provides further information about existing conceptual definitions of social isolation and related terms, and how the components of these definitions map on to our proposed five domains. Definitions of our five conceptual domains of social isolation and related terms are as follows:

Network: quantity refers to quantitative social contact; e.g. the number of people in someone's social network, or the number or frequency of someone's social contacts over a period of time.

Network: structure refers to characteristics of people's social contacts, which do not involve any appraisal of the quality of the relationship: e.g. network density (how many of the people in someone's social network also know each other), and the characteristics of someone's social contacts (e.g. how many are kin, friends, colleagues, (mental) health and social care staff, mental health service users, drug users, etc.)

Network: quality refers to the perceived quality of someone's relationships. This domain includes measures of the quality of specific important relationships (e.g. with a partner, or parents). It also includes measures of qualitative information about all someone's individual social contacts (e.g. rating how many of someone's social contacts are friends, could be confided in, or could be missed).

Appraisal of relationships: emotional refers to people's overall appraisal of the perceived adequacy or impact of their relationships: e.g. loneliness or emotional social support. This domain does not directly relate to, and is not measured by, the number of or quality of specific individual relationships.

Appraisal of relationships: resources refers to someone's appraisal of their overall access to resources or perceived connectedness due to their relationships: e.g. individual social capital or tangible social support.

Our five domains enable three important distinctions to be made:

1. Objective versus perceived qualities of someone's social relationships. Network: size and network: structure domains provide quantitative (theoretically externally observable or verifiable) information about the number or structure of someone's social contacts. Network: quality and the two appraisal of relationship domains by contrast relate to an individual's qualitative appraisal of their relationships or social connectedness.

2. Individual relationships versus overall social/inter-personal connectedness. The three 'network' domains in our conceptual map relate to the quantity or quality of individual relationships. The information about these individual relationships may be summed to provide information about someone's relationships or social connectedness overall. The two 'appraisal of relationships' domains relate to people's subjective evaluation of their relationships overall, without direct reference to specific individuals.

3. Tangible (practical) and intangible (emotional) support from relationships. Appraisal of relationship: emotional refers to the perceived companionship, love and emotional support derived from someone's social/inter-personal relationships. Appraisal of relationships: resources refers to the perceived informational or instrumental support someone can obtain from their social/interpersonal relationships.

There are elements of existing conceptual terms which are not covered by our proposed five conceptual domains. These were excluded as not directly relating to social isolation or related terms and fall into three categories:

1. Negative aspects of relationships. Social isolation, loneliness and related concepts are defined by the presence or absence of contact or desired support from relationships, rather than

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negative aspects of social relationships. However, concepts of relationship quality, including expressed emotion, and some conceptualisations of social capital also consider the actively negative aspects of interpersonal relationships (such as criticism, or over-involvement), which require the presence of social contact and may occur independently of loneliness (see Appendix 1, Tables A1-5 and A1-6).

2. Participation in social, economic or political activity. This is relevant to social inclusion and included in some conceptualisations of social capital (see Appendix 1, Table A1-5).

3. Degree of trust, perceived shared norms or beliefs with someone's society or institutions of power. Conceptualisations of social capital and alienation both include consideration at societal level of politico-legal and moral norms and requirements and how these are perceived and experienced by individuals (see Appendix 1, Tables A1-5 and A1-7).

Our resulting conceptual map of social isolation and related terms used in mental health research is presented in Figure 2.

Figure 2. Social isolation and related concepts: conceptual map

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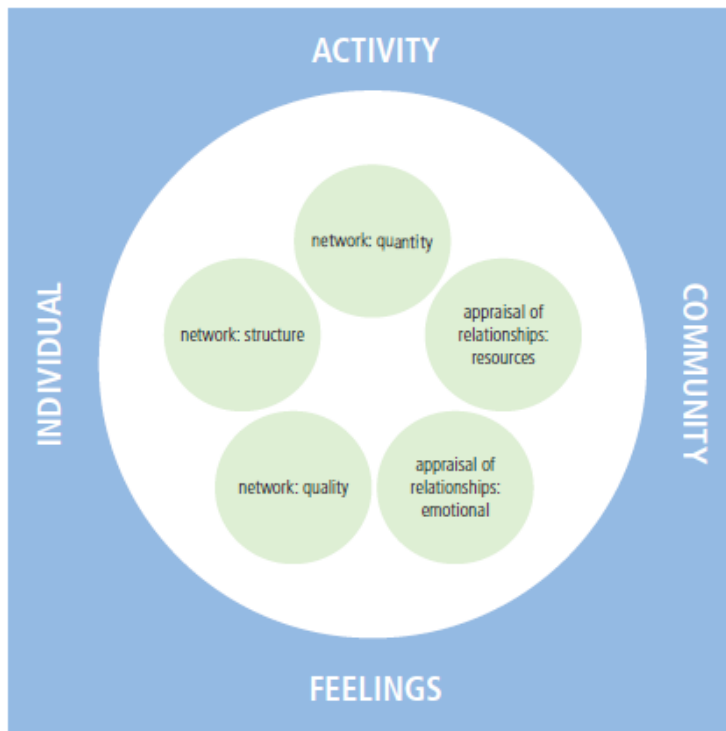
Measures

First, measures which are suitable for assessing each of our five proposed conceptual domains of social isolation and related terms (Table 2) are described. Second, we report multi-domain measures of social isolation or related terms which are primarily used to provide a total score covering more than one of our conceptual domains. In both cases, we followed specified criteria in selecting measures, prioritising ones which have been generally used, have adequate psychometric properties, and have been used in an adult mental health context.

Table 2. Suitable measures of conceptual domains of social isolation and related concepts

Domain	Measure	Description
Network: quantity	Social Network Schedule (Dunn et al. 1990)	Network size: the number of people with whom the respondent has had social contact in the last month
		Frequency of contact: the number of people whom the respondent has had social contact daily; weekly; or monthly over the past month
Network: structure	Social Network Schedule (Dunn et al. 1990)	Network density: the proportion of all possible ties between network members which are present (i.e. how many of a respondent's network know each other)
		Proportion of kin/non-kin in social network: how many of the total number of people within a respondent's social network are relatives?
Network: quality	Social Network Schedule (Dunn et al. 1990)	Confiding relationships: number of social contact people whom the respondent reports they can talk to about worries or feelings
		Would be missed: number of social contact people whom the respondent would miss if never seen again
Appraisal of relationships: emotional	UCLS-8 (Hays and DiMatteo 1987)	8-item, uni-dimensional scale of experienced loneliness
	De Jong-Gierveld Loneliness Scale (De Jong-Gierveld et al. 1985)	11-item scale of experienced loneliness, comprising social and emotional loneliness sub-scales
Appraisal of relationships: resources	Resource Generator-UK (Webber and Huxley 2007)	27-item scale assessing a respondent's access to resources within their social network, comprising four sub-scales: domestic resources, expert advice, personal skills, problem-solving resources

1. Social network domains

The Social Network Schedule (SNS) The SNS (Dunn *et al.* 1990) was designed for assessing the social networks of mental health service users, as part of the TAPS Study (a study evaluating outcomes for patients leaving long-stay psychiatric hospitals during a programme of deinstitutionalisation in the UK in the 1980s). The SNS schedule involves using a time budget and structured interview with a respondent to generate an inventory of all the people with whom they have had social contact within the last month. The frequency of interaction with each identified contact person (daily, weekly or monthly) and their role in relation to the respondent (e.g. relative, mental health staff member, provider of services, fellow service user) are recorded. For each contact person, the respondent is then asked whether they would miss the person if they never saw them again; whether they would visit the person if they moved away; whether they just say hello to the person, just do things for each other, or also have conversations (passive, intermediate or active contact); whether they consider the person a friend; and whether they consider the person a confidant (someone they can talk to about personal worries or feelings). The schedule can thus generate quantitative data for the number of people in someone's social network; the number of people seen daily, weekly or monthly; the proportion of people in different roles within the network; and the number of people who meet various qualitative criteria, e.g. friends, confidants, people who would be missed.

While the Social Network Schedule was originally developed for use in a study with residents of mental health inpatient services (Dunn *et al.* 1990), it has subsequently been used widely and internationally in inpatient and community mental health settings (Anderson *et al.* 1993, Becker *et al.* 1998b, Horan *et al.* 2006, Albert *et al.* 2011, Priebe *et al.* 2013, Lloyd-Evans *et al.* 2015), demonstrating its feasibility and providing reference data across a range of settings. The SNS is a self-report measure, so cannot be appropriately tested for inter-rater reliability between different informants. In testing where more than one interviewer records network data from the same respondent interview, the SNS has however demonstrated very good inter-rater reliability, with levels of agreement of over 97% (Dunn *et al.* 1990). Log linear modelling and latent class analysis of SNS data from a large sample in the TAPS study also support the validity of the designations of contacts in the schedule (Leff *et al.* 1990). Identifying whether or not a social contact is a confidant was found to be most salient, interacting significantly with all other SNS variables. Reports of whether a contact would be missed also related closely to other SNS variables relating to relationship quality (Leff *et al.* 1990). The SNS has demonstrated a degree of criterion validity, with network size and number of confiding relationships associated with quality of life (Becker *et al.* 1998a), and associated with and predictive of better social functioning (Howard *et al.* 2000).

A recent review of the social networks of people with psychosis (Palumbo *et al.* 2015) identified the SNS as one of the two most commonly used measures of social networks, along with the Network Analysis Profile (NAP) (Sokolovsky and Cohen 1981). Similar to the SNS, the NAP uses an inventory of social contacts elicited from a structured interview to identify the attributes of social contacts (member attributes), the nature of interactions between the respondent and each contact (linkage attributes), and characteristics of the respondent's network as a whole (network attributes). The validity of the assessed attributes and inter-rater reliability of the NAP appear to be less well established than for the SNS. Additionally, the NAP takes about two hours to administer, which may be too long for most studies or routine assessment (Siette *et al.* 2015).

In the light of the well-demonstrated feasibility across a range of settings and established good psychometric properties of the SNS, we recommend its suitability for assessing all three conceptual domains relating to network properties. While the SNS can be used to measure three of our proposed domains, scores for each measured variable can only be reported separately; no summary total score can be generated. In this way, the SNS is distinct from multi-domain measures described later.

Network quantity: The SNS can generate two useful variables relating to network quantity: network size (overall number of contacts seen at least monthly within someone's social network); and frequency of contacts (number of people seen daily, or weekly or monthly).

Network structure: Two variables relating to network structure which can be derived from the SNS are network density (how many of the contacts within someone's social network are also in contact with each other) and the proportion of kin and non-kin contacts within someone's network. People with psychosis have been found to have a higher proportion of kin than the general population within their social network (Palumbo *et al.* 2015). Both network density and non-kin relationships are of interest as possible indicators of access to 'weak ties' (Granovetter 1973), which may promote access to information and resources and recognition of social norms.

Network quality: The number of confidants and the number of social contacts who would be missed have both been identified in the SNS as good markers for relationship quality (Leff *et al.* 1990). These two variables may be preferable to measuring the number of friends in someone's social network, because of the challenges identified in previous literature of achieving a consistently understood definition of 'a friend' (Harley *et al.* 2012, Palumbo *et al.* 2015). The importance of confiding relationships as a protective factor against depression is well established (Brown and Harris 1978), increasing the interest in a mental health context of assessing the number of confiding relationships someone has.

While the SNS assesses characteristics of all the social contacts in someone's network, an alternative approach which has been used with the general population (Stansfeld and Marmot 1992) and adolescents (Furman and Buhrmester 2009) is to ask respondents to specify and rate the quality of a specified number of their closest relationships. Where such measures can be used to assess any type of relationship (so are not only applicable for instance to people having a partner, or living with parents), they are potentially useful to provide an aggregate score relating to network quality. Our review did not find measures using this approach which have been validated in mental health settings, but potentially appropriate, well-established relationship quality measures are described in Appendix 2.

2. Appraisal of relationship domains

Emotional appraisal: Loneliness measures have been well established and used in mental health settings to assess the overall perceived adequacy of a person's relationships to provide emotional support.

The University of California at Los Angeles (UCLA) Loneliness Scale was originally developed as a 20-item scale by Russell and colleagues in 1978 (1978) followed by a revised version in 1980 (Russell *et al.* 1980). They then developed version 3 of the scale with the response format and wording of the items simplified (Russell 1996). This version has been widely used in both the general population and clinical studies (Russell 1996, VanderWeele *et al.* 2011, Townley and Kloos 2014). This unidimensional scale is used to assess both the frequency and intensity of lonely experience during significant aspects and events in respondents' lives (Cramer and Barry 1999). Russell reported not only high reliability of the scale including both internal consistency and test-retest reliability after 12 months, but also good construct validity comprising convergent and discriminant validity and the validity of a unidimensional factor structure supported by confirmatory factor analysis (Russell 1996). To minimise respondent burden, Hays and DiMatteo (1987) derived an 8-item short-form measure from the 20-item UCLA Loneliness Scale, and demonstrated that it is reliable, valid and a good substitute for the 20-item version. Although the UCLA Loneliness Scale has been widely used as a global index of loneliness, some researchers suggested carefully explaining results derived from the instrument because it principally emphasised social loneliness, with additional reference to emotional loneliness and negative affect, but little assessment of family loneliness (feelings of isolation from immediate family members) (Ditommaso and Spinner 1993, Cramer and Barry 1999).

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The de Jong-Gierveld Loneliness Scale is another commonly used loneliness measure. It was originally developed as a 34-item multidimensional scale, but it was found mainly to measure severe feelings of loneliness (de Jong-Gierveld and Kamphuis 1985). Therefore an 11-item scale was developed with five positive and six negative items, which was reported to be easier to administer and suitable for lonely and non-lonely respondents (de Jong-Gierveld and Kamphuis 1985). Researchers can choose to use either the total 11-item scale or the separate social and emotional subscales (De Jong Gierveld and Van Tilburg 2006): the authors concluded that the data conform adequately to a unidimensional structure (Hays and DiMatteo 1987). De Jong-Gierveld and colleagues confirmed that both the reliability and construct validity were adequate (de Jong-Gierveld and Kamphuis 1985, Cramer and Barry 1999, de Jong Gierveld and van Tilburg 1999). A shorter six-item version was also developed for use in large surveys, with three items for emotional loneliness and the other three items for social loneliness (De Jong Gierveld and Van Tilburg 2006, 2010). This six-item version of the scale also yields a total score and two subscale scores, with factor analysis providing some confirmation for the two subscales of social and emotional loneliness (De Jong Gierveld and Van Tilburg 2006).

Resource appraisal: Instruments which exclusively measure the perceived ability of social contacts to help with access to resources are few, with the domain often included in broader measures of social support or social capital.

The Resource-Generator UK (RG-UK) (Webber and Huxley 2007) asks respondents whether they could access 27 types of informational or practical support from someone they know, to generate a total measure of access to resources within their social network. The scale comprises four subscales: domestic resources, expert advice, personal skills, and problem-solving resources. The measure has good content validity, having been developed through a rigorous focus group and expert panel process. It has also demonstrated moderately good inter-rater reliability (ibid.) It has subsequently been shown to be feasible for use in mental health settings and to have a degree of criterion validity in this context, being negatively associated with experienced stigma (Webber *et al.* 2014). A limitation of the RG-UK acknowledged by its developers (Webber and Huxley 2007) is that it is context and culturally-specific to the UK: it may require updating or adaptation to ensure validity in other countries.

3. Multi-domain measures

Our review also identified numerous measures covering more than one of our proposed conceptual domains. In particular, our review supports the observation reported by Huxley and colleagues (2012) that 'measures of social support are as varied as the number of investigators'. These measures, while they often comprised more tightly focused sub-scales, generate and typically report most prominently a total score. While such instruments can provide data broadly relating to social isolation or related terms within a single measure, interpreting scores or the meaning of changes in scores is made difficult because they reflect more than one distinct concept. We have described a number of these multi-domain measures in Appendix 2, prioritising measures which have been widely used, demonstrated good psychometric properties and been shown to be feasible in mental health settings.

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Discussion

This review provides an overview of existing definitions of social isolation and related terms especially in relation to mental health, and proposes a conceptual model with five domains to include all elements of current conceptualisations. These five domains are:

- social network: quantity
- social network: structure
- social network: quality
- appraisal of relationships: emotional
- appraisal of relationships: resources

We also identified some well-developed measures suitable for assessing each of the five conceptual domains or covering multi-domains.

Comparison with other conceptual reviews

Shortly after the initial submission of this review, another conceptual review of loneliness and social isolation was published (Valtorta et al. 2016). To our knowledge, that review and ours are the only two conceptual reviews of the full range of concepts in relation to social isolation and related terms. Valtorta and colleagues reviewed measures of loneliness, social isolation and social relationships used in studies of older adults, and of cardiovascular disease. Fifty-four measures were included in the review, including measures of social support, social isolation, social network and loneliness. From this review, Valtorta and colleagues developed a framework for classifying and comparing measures, which proposed two dimensions:(i) whether measures covered structural or functional aspects of social relationships; and (ii) the degree of subjectivity asked of respondents.

Although Valtorta and colleagues reviewed literature from two other subject areas rather than mental health literature, the findings from their review were highly compatible with ours. The four concepts measured by instruments included in their review (social support, social isolation, social network and loneliness) were included in our review, which also considered measures of social capital, confiding relationships, and alienation. The two dimensions proposed by Valtorta and colleagues can also be distinguished in our conceptual model. The domains in our model of 'network quantity' and 'network structure' describe objective and structural characteristics of social relationships; while 'network quality', and the two 'appraisal of relationships' domains in our model describe functional and subjective characteristics. Our model is in addition able to distinguish characteristics of a person's individual social relationships versus their relationships and inter-personal connectedness overall; and emotional and practical elements of the functional characteristics of social relationships.

The compatibility of conceptualisations between these two reviews, despite the different literatures surveyed, provides a degree of validation for both, and suggests our conceptual model may be of general use when considering concepts relating social isolation, not just in studies of mental health. There was an absence, in the review by Valtorta and colleagues compared to ours, of additional existing concepts retrieved from literature searching, and of additional new conceptual domains developed through a synthesis of relevant studies. This suggests that, despite the limitations in the scope and methods of our review discussed below, our review was sufficiently thorough and in depth to develop a robust conceptual model.

Strengths and limitations

Given the nature of this conceptual review, we conducted an iterative approach. This involved some overlap in the tasks of literature searching, and data extraction and data synthesis, to ensure that all relevant concepts could be included and so that a useful conceptual model could be generated. We sought to ensure the validity of our conceptualisation of social isolation and related terms by following an established process for conducting conceptual reviews (Lilford *et al.* 2001) and consulting with external experts during the process. Our review provided a comprehensive model with five conceptual domains into which all relevant conceptual terms fit well.

Three limitations relate to the scope of the review. First, it was not our intention to describe conceptualisations of how people relate to each other within a society or their relation to the larger social order. Our review attempts to synthesise existing conceptualisations and measures of social isolation and related terms at an individual level rather than looking at their societal context, which will vary greatly.

Second, the review focused on how social isolation and related terms have been conceptualised and measured in the field of mental health. Where papers retrieved in our search used definitions or measures of social isolation or loneliness, we sought to identify the original source of these, even if outside the mental health field. Through this process, our review includes concepts and measures from other fields of study which have been used in mental health contexts. But conceptualisations or measures which have not yet been used in mental health settings were outside the scope of our review, so some potentially useful concepts and measures may therefore have been overlooked. We have only reported measures which have been used and validated with mental health populations; their suitability for other population groups is not covered by our review.

Third, our review focused on social isolation and related terms, which have been mainly conceptualised as relating to a lack of relationships or positive aspects of existing relationships. As such, our review did not fully explore how negative aspects of relationships have been defined or measured, and scales measuring negative characteristics of social contact or relationships were rare among those identified by our review. When people report 'low' social support using a score, it may reflect either the absence of support from others or the presence of a negative, conflictive relationship (Coyne and Bolger 1990), but most social support scales are not able to distinguish these potential meanings of low support (Coyne and Downey 1991). An exception is 'the Close Persons Questionnaire' (Stansfeld and Marmot 1992) which includes items on three types of support – confiding/emotional support, practical support and negative aspects of support. Portes (1998) also proposes the concept of 'negative social capital' deriving from peer pressures for exclusive in-group bonding, or high demands from others. Negative aspects of relationships, such as high expressed emotion or interpersonal friction, have been shown to be associated with poor outcomes in schizophrenia and affective disorders (Vaughn and Leff 1976, Coyne and Downey 1991, Stansfeld and Marmot 1992, Zoellner *et al.* 1999, Crevier *et al.* 2014). The conceptualisation and measurement of negative aspects of relationships is a fruitful area for a future review.

Because our conceptual review used an iterative search strategy rather than searching for predefined terms, our review cannot be replicated exactly and we cannot be certain that all relevant papers were included.

Two further potential limitations of the review relate to the search strategy and procedures. First, the initial electronic search was only conducted in Web of Science with time limits 2013–2015, due to the wide range of searching concepts and the large amount of articles retrieved. As a result, important studies may have been missed, although further relevant studies were identified through review articles and through reading full text or reference lists of included studies. Before this process was concluded, we reached a point where new conceptual definitions of terms or new measures were rarely being identified, indicating that saturation of novel information had been reached. Second, screening of potentially relevant studies was conducted by a team of researchers,

with no formal checks of reliability in researchers' selection of relevant studies. To mitigate this potential problem, study authors (JW, BLE) provided training for all the researchers involved in literature searching and were consulted in the event of uncertainty about studies' relevance.

A gap in the literature: online social relationships

The concepts and measures of social relationships retrieved for our review rarely included consideration of online social contact. However, online relationships may play a significant role in social life of people with mental illness (Highton-Williamson et al. 2015). People with mental disorders may have greater social isolation and loneliness comparative to the general population due to their symptoms (Clinton et al. 1998, Borge et al. 1999, Garety et al. 2001, Lauder et al. 2004). However, they appear to use social media and online networking similarly to the general population (Ennis et al. 2012, Firth et al. 2015). It may therefore be important to assess online social contact in considering social isolation and related terms in mental health. However, the literature in this field is small and needs to be more systematically explored.

Highton-Williamson and colleagues (2015) carried out a systematic review of online social networking in patients with psychosis. Among the 11 articles included in their review, most were qualitative research, case reports and analyses of postings (Highton-Williamson et al. 2015). Among those which used measures to assess online social networking, the researchers either designed questionnaires themselves or adapted measures from previous studies (Mittal et al. 2007, Spinzy et al. 2012, Martini et al. 2013), regarding the amount of time spent in various social activities on the internet, frequency of internet use for different needs, number of online contacts, or knowledge of social networking sites. There appears therefore to be a lack of a reliable and validated measure of online social relationships and this has hampered comparisons of results across studies (Highton-Williamson et al. 2015). Development of such a measure would be a useful focus for future research.

Implications

This review has demonstrated that social isolation and related terms are not simple concepts and the boundaries between them are often blurred, although they can be conceptually categorised within a relatively small number of domains. This is not of academic interest only: concept clarity can support intervention development and evaluation. Loneliness and social isolation, for instance are not always highly correlated: a Finnish study of older adults, for example, found no relationship between reported loneliness and frequency of contact with family (Routasalo et al. 2006). The authors argue that interventions only aiming to increase the number of social contacts may not reduce loneliness; attention to the received emotional support from relationships, and to subjects' own inner expectations may also be required (Routasalo et al. 2006). A range of interventions may therefore be required to address different problems relating to people's social relationships. Further research is also needed to understand which aspects of people's social relations are most important in sustaining good mental health or recovering from mental illness. In both cases, precision about what exactly is being studied and how best to measure it is essential.

The need for better evidence regarding the effectiveness of social interventions is widely accepted (Oakley 1998, NICE 2014). Our review can contribute to this in the area of social isolation and related terms by helping researchers and intervention developers to specify expected outcomes of interventions and mechanisms of effect more precisely, and measure them appropriately. Conceptual clarity can also help researchers explore relationships between social isolation and other outcomes, and directions of effect, more precisely. Our review offers an overview of concepts relating to social isolation and proposes a conceptual model which fits all of them. It can help researchers and practitioners to understand more profoundly the meaning of and difference between these closely related concepts, and how they can be measured in the field of mental health.

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Appendix 1: Conceptualisations of social isolation and related concepts in existing literature, and their fit with our proposed domains

Table A1-1. Conceptualisations of social isolation

Reference	Attributes	Fit with proposed domains*
Zavaleta et al. (2014)	Internal social isolation(satisfaction with social relations, need for relatedness, loneliness, feeling of belonging to community, trust)	4, 5
	External social isolation(frequency of social contact, social network support, presence of a discussion partner, reciprocity and volunteering)	1, 3
Nicholson (2009)	Number of contacts	1
	Feeling of belonging	4
	Fulfilling relationships	4
	Engagement with others	5
	Quality of network members	3

Table A1-2. Conceptualisations of loneliness

Reference	Attributes	Fit with proposed domains*
Hawkley et al. (2008) Peplau and Perlman (1982) Paloutzian and Ellison (1982)	Perceived deficiencies in quantity of one's social relationships	4
	Perceived deficiencies in quality of one's social relationships	4
Weiss (1974)	Social-isolation loneliness (absence of an engaging social network)	4
	Emotional-isolation loneliness (absence or loss of close attachment relationships)	4
Kearns et al. (2015)	Feelings (feeling of being on one's own associated with not having sufficient intimate and/or other contacts, or contacts of the right type)	4
	Circumstances (an individual's social contacts and social support, both in an everyday sense (who one sees, talks to, etc.) and as a latent resource (knowing who can be relied upon for help or support))	5
	Responses (a consequence of how people cope with, and respond to, their social situation)	6

*Notes:
1 Network: quantity
2 Network: structure
5 Appraisal of relationships: resources
4 Appraisal of relationships: emotional
3 Network: quality
6 Other domains (not directly related to social isolation or loneliness)

Table A1-3. Conceptualisations of social support

Reference	Attributes	Fit with proposed domains*
Cohen and Wills (1985)	Structural social support (existence and form of the social network)	1, 2
	Functional social support (how the network serves to provide different kinds of support)	4, 5
Barrera et al. (1981)	Tangible forms of assistance (provision of goods and services)	5
	Intangible forms of assistance (guidance and expressions of esteem)	4
Barrera (1986)	Social embeddedness (connections to significant others: measured quantitatively – either by presence or absence of indicators, e.g. married, participating in community groups etc., or through social network analysis)	1, 2
	Perceived social support (self-reported perceived availability and adequacy of supportive ties)	4
	Enacted support (reported receipt of helping activity from others)	5
House (1981)	Emotional support (empathy, love, trust and caring)	4
	Instrumental support (tangible aid and services)	5
	Informational support (advice, suggestions and information)	4
	Appraisal support (information useful for self-evaluation)	4
Dour et al. (2014)	Emotional (a resource who listens and validates)	4
	Instrumental (practical support)	5
	Informational (advice)	4
	Companionate (people with whom to socialise)	4
	Feedback (feedback on community's behavioural expectations)	4
Dour et al. (2014)	Perceived support	5
	Received support (how often supportive behaviours are received)	1, 2
	Social integration (diversity/ number of relationships)	4

*Notes:
1 Network: quantity   4 Appraisal of relationships: emotional
2 Network: structure   3 Network: quality
5 Appraisal of relationships: resources   6 Other domains (not directly related to social isolation or loneliness)

(continued).

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Table A1-3. Conceptualisations of social support (continued)

Reference	Attributes	Fit with proposed domains*
Cobb (1976)	Informational	4
	Tangible	5
	Esteem	4
	Emotional	4
	Social network	4
House (1981) Cohen and Hoberman (1983) Wills (1985)	Emotional support (caring, love and empathy)	4
	Instrumental support (tangible support)	5
	Information, guidance or feedback that can provide a solution to a problem	4
	Appraisal support (information relevant to self-evaluation)	4
	Social companionship (spending time with others in leisure and recreational activities)	4
Hand et al. (2014)	Tangible support	5
	Affectionate support	4
	Emotional support	4
	Informational support	4
	Positive social interaction support	4
Ben-Zur et al. (2014)	Emotional assistance (e.g. sympathy, care)	4
	Informative assistance (e.g. advice)	4
	Instrumental assistance (e.g. financial aid or loans, help with responsibilities)	5
Melrose et al. (2015) Haber et al. (2007) Sarason et al. (1990)	Received support (quantity of supportive behaviors received by an individual)	5
	Perceived support (both the availability of support and satisfaction with it)	4

*Notes:
1 Network: quantity   4 Appraisal of relationships: emotional
2 Network: structure   3 Network: quality
5 Appraisal of relationships: resources   6 Other domains (not directly related to social isolation or loneliness)

(continued).

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Table A1-3. Conceptualisations of social support (continued)

Reference	Attributes	Fit with proposed domains*
Lin et al. (2015)	Action-facilitating support (informational support and tangible aid)	5
Cutrona and Suhr (1994)	Nurturant support (emotional support and network support)	4
Yan and Tan (2014)	Informational support	4
Berkman et al. (2000)	Emotional support	4
	Companionship	4
Wortman and Conway (1985)	Instrumental assistance	5

*Notes:
1 Network: quantity   4 Appraisal of relationships: emotional
2 Network: structure   3 Network: quality
5 Appraisal of relationships: resources   6 Other domains (not directly related to social isolation or loneliness)

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Table A1-4. Conceptualisations of social networks

Reference	Attributes	Fit with proposed domains*
Cohen and Sokolowski (1978)	Morphological characteristics of networks (quantitative properties of a network: size = number of contacts; degree = average number of links each person in network has with others in the network; density = actual links between network members as a proportion of all possible links)	1, 2
	Interactional characteristics of networks (the nature of relationships: intensity = whether relationships are 'uniplex' (one function only) or 'multiplex' (more than one function); directionality = who is helping whom in a dyadic relationship)	3
Burt (1982)	Size	1
	Density	2
	Boundedness (the degree to which the networks are defined by traditional structures such as kin, neighbours, work)	2
	Homogeneity (how similar members are to each other)	2

*Notes:
1 Network: quantity　　　　　　　　　　　　4 Appraisal of relationships: emotional
2 Network: structure　　　　　　　　　　　　3 Network: quality
5 Appraisal of relationships: resources　　　6 Other domains (not directly related to social isolation or loneliness)

Table A1-5. Conceptualisations of individual social capital (as a characteristic of a community or an individual)

Reference	Attributes	Fit with proposed domains*
Granovetter (1992) Putnam (1995)	Structural (quantity and morphology of social contacts and social participation)	1, 2, 6
	Relational (perceived support, trust and sense of belonging derived from relationships)	4, 5, 6
Grootaert and Van Bastelaer (2002)	Structural (established roles, social networks and other structures which can facilitate information sharing and participation)	1, 2, 6
	Cognitive (shared norms, values, trust, attitudes and beliefs)	4, 5, 6
Nahapiet and Ghoshal (1998)	Structural (quantity and morphology of social networks)	1, 2
	Relational (perceived support)	4, 5
	Cognitive (shared interpretations or systems of meaning with others (norms))	5, 6
Putnam (1996) Szreter and Woolcock (2004)	Bonding ('strong ties' with proximal social network, characterised by loyalty, homogeneity and exclusivity)	4, 5
	Bridging ('weak ties' with more distal social network, likely to foster social inclusion and participation)	5, 6
Bird et al. (2010)	Bonding	
	Bridging	
	Linking (relationships/ties to people in formal institutions of power)	5, 6
Chen et al. (2009)	The extent to which relationships are characterised by: Durability Trustworthiness Resource-richness Reciprocity	4, 5
Portes (1998)	Instrumental social capital (relating specifically to the ability of someone's relationships and social connections to help them access resources: a sub-component of relational social capital)	5
Portes (1998	Negative social capital (e.g. exclusive in-group bonds such as gang membership may inhibit social contact with others; excessive demands from others in someone's social network)	6

*Notes:
1 Network: quantity   4 Appraisal of relationships: emotional
2 Network: structure   3 Network: quality
5 Appraisal of relationships: resources   6 Other domains (not directly related to social isolation or loneliness)

(continued).

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Table A1-5. Conceptualisations of individual social capital (as a characteristic of a community or an individual) (continued)

Reference	Attributes	Fit with proposed domains*
Kim and Harris (2013)	Five dimensions of social capital: Social norms Trust Partnership with community Information sharing Participation in society	4, 5, 6,
Frank et al. (2014)	Five dimensions of social capital: Trust Safety Cohesion Engagement Reciprocity	4, 5, 6,

Table A1-6. Conceptualisations of confiding relationships and related concepts

Reference	Attributes	Fit with proposed domains*
Brown and Harris (1978)	Confiding relationship (having an intimate partner or other in whom one can confide – i.e. discuss problems and feel listened to)	3
Langston (1994)	Capitalisation support (the extent to which a partner or other confidant provides a perceived supportive reaction to a personally meaningful event)	3
Rook (1987)	Companionship (presence of companionate relationships within someone's social network which allow participation in activities, recreational or other, for the purpose of enjoyment (i.e. not instrumental resources))	3
Rusbult et al. (1994)	Relationship quality (the 'investment model' includes four aspects of intimate relationships affecting their quality: overall commitment, satisfaction, quality of alternatives, investment)	3

*Notes:
1 Network: quantity
2 Network: structure
5 Appraisal of relationships: resources

4 Appraisal of relationships: emotional
3 Network: quality
6 Other domains (not directly related to social isolation or loneliness)

Table A1-7. Conceptualisations of alienation

Reference	Attributes	Fit with proposed domains*
Durkheim (1897)	Characteristic of an individual	4, 5
	Characteristic of a society	6
Dean (1961)	Powerlessness: "separation" from effective control over his economic destiny; of his helplessness; of his being used for purposes other than his own	6
	Normlessness: (purposelessness and conflict of norms)	6
	Social isolation: 'feeling of separation from the group or of isolation from group standards' (referring to Durkheim's concept of 'anomie')	6
Ifeagwazi et al. (2015) Seeman (1959, 1975) Meszaros (1970) Maddi (1967)	Powerlessness: 'Expectancy or the probability held by the individual that his own behavior cannot determine the occurrence of the outcome or reinforcements he seeks' (Seeman 1959)	6
	Meaninglessness; 'the individual is unclear as to what he ought to believe – when the individual's minimal standards for clarity in decision-making are not met' (Seeman 1959)	6
	Self-estrangement: 'the inability of an individual to find self-rewarding – or … self-consummatory – activities that engage him' (Seeman 1959)	6
	Normlessness: 'high expectancy held by the individual that socially unapproved behaviours are required to achieve given goals' (Seeman 1959)	6
	Isolation: Individuals 'assign low reward value to goals or beliefs that are typically highly valued in the given society' (Seeman 1959)	6
Ifeagwazi et al. (2015) Ernst and Cacioppo (1999) Lopez-Calva et al. (2012) Citrin (1977)	Interpersonal alienation: Feelings of being taken advantage of, being left out of things going on around, people around me would not do much if something happened to me, and feelings that one's personal thoughts do not matter (Lopez-Calva et al. 2012)	4, 5
	Political alienation: 'the extent of one's attachment to the ongoing political order or estrangement from society's central institutional system of government' (Ifeagwazi et al. 2015)	6
	Socioeconomic alienation: 'may be marked by poverty, limited prospects of [sustainable] employment, and lack of business opportunities and skills relevant to the market needs' (Ifeagwazi et al. 2015)	6

*Notes:
1 Network: quantity
2 Network: structure
5 Appraisal of relationships: resources

4 Appraisal of relationships: emotional
3 Network: quality
6 Other domains (not directly related to social isolation or loneliness)

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Appendix 2: Multi-domain measures relating to social isolation and related concepts

Measure	Focus	Description	Psychometric properties and use
Close Persons' Questionnaire (Stansfeld and Marmot 1992)	Social support from close relationships	14-item measure. Three subscales: emotional and practical support and negative aspects of relationship.	Moderately good test-retest reliability and some criterion validity (moderate relationship with received social support) established. Participants select and rate their most important close relationships, creating a composite score. Used with general population; not validated for a mental health population
Interview Measure of Social Relationships (IMSR) (Brugha et al. 1987)	Personal social resources	Multidimensional: size and density of the primary social network, contacts with acquaintances, adequacy of interaction and supportiveness of relationships, and crisis support.	Good inter-rater reliability, a high degree of temporal stability of close relationships, and good acceptability for use in large-scale surveys of individuals with differing social and educational backgrounds
Adapted Social Capital Assessment (SASCAT) (Harpham et al. 2002)	Social capital	18-item. Two dimensions: Structural component: assesses group membership, support (emotional, economic and/or assistance) received and involvement in citizenship activities over the previous year. Cognitive component: evaluates trust in community, interpersonal relationships among community members, sense of belonging to community, and perception that other community members may try to take advantage if given the chance.	'Psychometric techniques show SASCAT to be a valid tool reflecting known constructs and displaying postulated links with other variables'; good face and content validity
Dean Alienation Scale (Dean 1961)	Alienation	24-item scale. Three subscales: powerlessness, normlessness and social isolation.	Strong face validity, construct validity, and acceptable levels of internal consistency reliability established

(continued).

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Measure	Focus	Description	Psychometric properties and use
Medical Outcomes Study (MOS) Social Support Scale (Sherbourne and Stewart 1991)	Social support	20-item. Four dimensions: emotional/informational, tangible, affectionate, and positive social interaction.	Reliable (all Alphas >0.91) and fairly stable over time, construct validity hypotheses supported
Social Provisions Scale (SPS) (Cutrona et al. 1987)	Social support	24-item. Six dimensions: guidance, reassurance of worth, social integration, attachment, nurturance, reliable alliance.	A reliable and valid measure with adequate reliabilities and construct validity
Interview Schedule for Social Interaction (ISSI) (Henderson et al. 1980)	Social relationships	52-item. Two dimensions: availability and adequacy.	Sufficiently valid and reliable, and also sensitive to predictable variations between socio-demographic groups, to justify its use in clinical and epidemiological studies, both in psychiatry and general medicine
Abbreviated Duke Social Support Index (DSSI) (Koenig, Westlund et al. 1993)	Social support	23-item. Three subscales: social interaction, subjective support, instrumental support.\n\n11-item. Two subscales: social interaction and subjective support.	High reliability and validity, e.g. high internal consistency and correlated with hopelessness and anxiety
Interpersonal Support Evaluation List (ISEL) (Cohen and Hoberman 1983; Cohen et al., 1985)	Social support	48-item. Four domains: tangible, appraisal, self-esteem and belonging subscales.\n\n12-item. Three subscales: appraisal, belonging, and tangible social support.\n\n6-item. Two dimensions: emotional and tangible.	Internal consistency and test retest reliability ranging from .70-.80, with moderate intercorrelation
Social Supporting Rating Scale (SSRS) (Cao et al. 2011)	Social support	10-item. Three dimensions: objective social support, subjective social support, utilisation of support.	Good reliability and validity
Multi-dimensional Scale of Perceived Social Support (MSPSS) (Zimet et al. 1988)	Social support	12-item. Two dimensions: perception of total social support, and perceived support from significant other/friends/family.	Internal consistency for the subscales was very high

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