No Man is an Island:
Exploring the Links between Social Connectedness and Trust in Clinical Paranoia using a Virtual Reality Paradigm

Hannah Reidy

D. Clin. Psy. Thesis (Volume 1)

2016

University College London

UCL Doctorate in Clinical Psychology

Thesis declaration form

I 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.

Signature:

Name: Hannah Reidy

Date: 17th June, 2016

Overview

This thesis addresses the links between social support and isolation and symptoms of psychosis. Part One presents a meta-analysis of longitudinal studies investigating the association between social support at baseline and symptomatic recovery at a later time-point. It considers whether the type of social support measure, or the length of time between baseline and follow-up, impact on this association. A small, significant positive association was found between higher levels of social support and likelihood of symptomatic recovery. No impact of social support measure or time to follow-up was identified.

Part Two reports on an empirical virtual reality study which examines associations of current social connectedness and attachment style with the experience of trust towards a friendly avatar, in eighteen males with clinical paranoia. Significant negative associations were found between level of social factors involving resource and integration, and objective trusting behaviour towards the avatar. Secure versus insecure attachment style was differentially related to level of objective trust. Associations were not found between social connectedness measures or attachment style and subjective trust of the avatar. The empirical study was a joint project completed with Gail Wingham (GW), a fellow University College London D. Clin. Psy. Trainee. The findings from this researcher's thesis are presented separately.

Part Three is a critical appraisal of the meta-analysis and empirical study. It considers recruitment of clinical populations for virtual reality research, discusses methods of effectively analysing the findings of small-n research, and reflects on the field of virtual reality and its potential implications for future research and clinical applications.

Table of Contents

List of Tables

List of Figures

Acknowledgements

I would like to sincerely thank my thesis supervisors, Dr Miriam Fornells-Ambrojo and Professor Chris Barker for all of their invaluable help and expertise throughout this research, as well as their optimism and creative thinking throughout the various stages of the process. A big thank you is also owed to Dr David Swapp for all of his assistance with the virtual reality environment, and his flexibility and understanding with our use of his lab.

To the joint researcher on this project, Gail Wingham. I am incredibly lucky to have had the privilege of working with such a proficient and talented researcher, and feel even luckier to have built such a wonderful friendship with you over the past three years.

I am extremely grateful to the participants; for giving up their time to participate in the research, for their honest and thorough answers to the study questionnaires, and for allowing me such a clear insight into the way that they experience the world. I would also like to thank the Care Coordinators and Early Intervention in Psychosis teams that helped us to identify and recruit participants despite their own heavy workloads and many conflicting priorities.

Thank you to my own much-needed and much-valued social support. My wonderful friends, especially those from the D.Clin.Psy. course, who have been in this experience alongside me. My parents, for their unwavering support, occasional crisis-management skills, and their proof-reading expertise.

To my husband-to-be, Simon. Thank you for your love and forbearance throughout this process, for the tea and meals so regularly provided, and for managing all of the other stressors in our lives so that I could concentrate on this when I needed to. I am looking forward to adding both a “Dr” and a “Mrs” to my name over the coming months. And yes, I will tidy the papers off the dining table now.

A final note of thanks must go to our cat, for his fluffy companionship during long spells of writing, and his seemingly innate ability to walk over the keyboard at the most inopportune moments. Any typos are his responsibility.

No man is an island,

Entire of itself;

Every man is a piece of the continent,

A part of the main.

John Donne (1624)

Part 1: Literature Review

A meta-analysis of the role of social support in symptomatic recovery from psychosis

Abstract

Aims: This meta-analysis sought to examine the association in individuals with psychosis between social support at baseline and symptomatic recovery at a later time point. It also investigated differences between subjective and objective measures of social support, and time from baseline to follow-up.

Methods: Four databases were searched, yielding seven studies (comprising nine samples). A meta-correlation was completed to determine an aggregate effect size. Additionally, correlations of subjective and objective measures and a meta-regression of follow-up interval were run.

Results: A small but significant association was found between social support at baseline and symptoms at follow-up. This effect was consistent for both subjective and objective measures of social support, and remained stable over duration from baseline to follow-up.

Conclusions: Social support may partly explain symptomatic recovery from psychosis at a later time-point. This finding is discussed in the context of methodological and conceptual limitations. The dynamic nature of this relationship, as well as the complexities in defining both social support and recovery are explored, and clinical implications of the role of social support in symptomatic recovery are discussed.

1. Introduction

Social support has long been shown to have a positive impact on mental health (Cohen, Underwood, & Gottlieb, 2000; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Its impact can be both a direct main effect; for example by improving an individual's mood through pleasurable social engagement and facilitating social engagement, as well as indirect; through acting as a buffer against stressful negative life events (Buchanan, 1995; Kawachi & Berkman, 2001; Kessler & McLeod, 1985). However it is only in recent years that social factors have been examined within psychosis research (Leff, 2008).

1.1 Overview of factors influencing the course of psychosis

A range of precipitants and predictors of psychosis have been identified. Longer duration of untreated psychosis (DUP) (Norman & Malla, 2001), is associated with poorer outcomes as defined by symptom severity, likelihood of remission and poor social and global functioning (Marshall et al., 2005; Penttilä, Jääskeläinen, Hirvonen, Isohanni, & Miettunen, 2014; Perkins, Gu, Boteva, & Lieberman, 2005). Poor cognitive function is robustly associated with a more negative course of the condition (Bozikas & Andreou, 2011; Fioravanti, Carlone, Vitale, Cinti, & Clare, 2005; Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001). Factors such as female gender (Ochoa, Usall, Cobo, Labad, & Kulkarni, 2012), and a treatment combining both psychological and pharmacological intervention (Menezes, Arenovich, & Zipursky, 2006) increase likelihood of remission of psychosis.

An individual's social environment seems also crucial to understanding psychosis (Cantor-Graae, 2007; Morgan, McKenzie, & Fearon, 2008).

1.1.1 Childhood adversity

Significant associations have been found between childhood adversity, a correlate of the early social environment, and risk of experiencing psychosis in adult life (Morgan &

Fisher, 2007; Read, van Os, Morrison, & Ross, 2005; Varese et al., 2012). Specific links between the nature of adversity and the class of psychosis symptom, for example between Childhood Sexual Abuse and auditory hallucinations, are reported, and underlying biological mechanisms hypothesised (Bentall et al., 2014; Bentall & Fernyhough, 2008); Hardy (2016); Longden & Read (2016).

1.1.2 Attachment style

Formed through the early interpersonal environment around a child (Bowlby, 1969), an insecure attachment style is linked with experience of childhood adversity (Berry, Barrowclough, & Wearden, 2008). The concept is linked with psychosis: a higher proportion of individuals who experience the condition display an insecure attachment style when compared to individuals from the general population (Allardyce & Boydell, 2006; Berry, Barrowclough, & Wearden, 2007; Gumley, 2014; Read & Gumley, 2008). Attachment style may mediate links between early adversity and later life difficulties, such as experiencing psychosis, due to the cognitive processes that an individual utilises to manage distress (Read & Gumley, 2008; Shapiro & Levendosky, 1999).

1.1.3 The current social environment

Adversity stemming from physical and demographic characteristics of the social environment is further associated with risk of clinical psychosis. Rates of psychosis increase with level of urbanicity (Allardyce & Boydell, 2006; March et al., 2008; Vassos, Pedersen, Murray, Collier, & Lewis, 2012). This effect is reported to be stronger with early-life exposure to urbanicity (March et al., 2008), perhaps due to the prevalence of powerlessness and under-privilege experienced by individuals living in this environment (Bentall & Fernyhough, 2008). Ethnic density (defined as the percent composition of a given ethnicity within a geographical area) has a significant protective effect against psychosis (March et al., 2008; Schofield, Ashworth, & Jones, 2011; Veling et al., 2008). Rates of psychosis within

ethnic minority populations are lower in neighbourhoods with a higher ethnic density, and this effect stays consistent when taking into account factors such as neighbourhood deprivation (Boydell et al., 2001), implying the role of a social component such as social support (Allardyce & Boydell, 2006).

1.2 Social support: a complex construct

"Social support is defined as information leading the subject to believe that he is cared for and loved, esteemed, and a member of a network of mutual obligations."

(p.300, Cobb, 1976)

Since Cobb´s widely accepted definition of social support in 1976, the diversity in the conceptualisation of this construct has been extensively commented on in the literature, and it is increasingly understood as a complex and multi-factorial concept (Buchanan, 1995; Gottlieb, 1983; Kawachi & Berkman, 2001; Turner & Brown, 2010). Table 1 operationalises key terms and definitions of social support constructs.

Table 1: Key concepts within social support

Concept	Sub-theme	Definition
Social network	Structural	The pattern and structure of the social network relationships: for example reciprocity, strength of bond, similarity of network members, density of relationships (Pearlin, 1985).
Social network	Functional	The actual level of instrumental or informational assistance provided by social network (House, Umberson, & Landis, 1988)
Social support	Emotional	The appraisal of belonging to a communicative/caring social network, and availability of empathy and reassurance (Cobb, 1976).
Social support	Instrumental	The provision of material aid: for example financial assistance or help with daily tasks (Cohen, 2004).
Social support	Informational	The provision of relevant information intended to help the individual cope to with current difficulties: for example advice; guidance in dealing with problems (Cohen, 2004)
Social capital	n/a	The value of resources embedded within a social network, emphasising the importance of network members' resources such as wealth, power and status, to an individual (Lin, Cook, & Burt, 2001).
Social integration	n/a	The degree of participation in a broad social relationships, including a behavioural component (the degree of active engagement in social activities and relationships) and a cognitive component (the sense of identification and satisfaction with social role) (Brissette, Cohen, & Seeman, 2000).

The construct of social support can be divided into different components including an individual's social network, the social support received, the social integration achieved, and an individual's access to social capital. Within these concepts are subdomains: for example an individual may possess differing levels of emotional versus informational social support. Noting these distinctions is important, as it is feasible that they are the result of differing underlying processes; for example social integration is hypothesised to aid mental health via the main effect pathway, whereas sub-concepts of social support such as emotional support are thought to act via the indirect, stress-buffering pathway (Cohen, 2004).

Within these processes, the disparity between how an individual perceives their level of social support and the objective reality differs. Perceived social support (the degree to which social support can be anticipated when needed) and received social support (the recollection of specific recent social support actually experienced) are two separate but related constructs (Haber, Cohen, Lucas, & Baltes, 2007). To date, evidence (Turner & Brown, 2010) finds that perceived support is the common element amongst most conceptualisations of social support, that it is seen by respondents as the most important element of social support (House, 1981), and that it displays the strongest links with mental health and psychological distress (Turner & Brown, 2010). Perceived support is, however, subject to more biases in perceptual, judgment, and memory processes; and inter-observer reliability is far lower than in measurements of received social support (Cohen, Lakey, Tiell, & Neeley, 2005).

1.2.1 Measurement of social support

These differing concepts within social support may be examined using either subjective (quantitative) or objective (qualitative) methods of measurement (Cobb, 1976). Subjective elements encompass the qualitative appraisal and satisfaction assigned to the

support received, whereas objective elements encompass a quantitative measure of the frequency or type of support and interaction accessed. Akin to perceived and received support, these methods of measurement do not show a perfect relationship: an individual may objectively possess a wide social network yet feel lonely or unsupported, and greater perceived support is not always indicative of number of social interactions (Sündermann, Onwumere, Kane, Morgan, & Kuipers, 2014).

1.3. The role of social support in psychosis

Perceived social support has been consistently associated with mental wellbeing across a range of mental health diagnoses (Berkman & Glass, 2000; Kawachi & Berkman, 2001; Leavy, 1983). The majority of this research base has examined the impact of low social support on the course of depression, however a growing number of studies have also linked the construct to both onset and course of psychosis (Buchanan, 1995; Gayer-Anderson & Morgan, 2013).

1.3.1 Social support and onset of psychosis

A recent review (Gayer-Anderson & Morgan, 2013) concluded that social network size (an objective measure of social support) of individuals experiencing a first episode of psychosis was almost always smaller (Macdonald, Hayes, & Baglioni, 2000), and frequency of contact with other network members lower than in non-psychosis comparison groups (Reininghaus et al., 2008). Subjective measures of social support yielded more diverse findings (Sündermann et al., 2014); some studies found that individuals with First Episode Psychosis feel less satisfied with social networks and received support than comparison groups (Song et al., 2011; Veling et al., 2008) whereas other studies found no such difference (Macdonald et al., 2000; Pruessner, Iyer, Faridi, Joober, & Malla, 2011).

1.3.2 Social support and the course of psychosis

Recovery is a multi-dimensional construct (Liberman & Kopelowicz, 2005). Specific to psychosis, symptomatic recovery can be conceptualised as an individual being free from symptoms of psychosis for a given period of time, and without need for a response from mental health services (Bebbington et al., 2006); or as scoring below a certain threshold on measures of psychiatric symptoms (Liberman & Kopelowicz, 2005). Symptomatic recovery may be assessed in relation to a range of domains of psychosis symptoms (positive, negative and depressive) (Andreasen et al., 1994). Social and cognitive deficits may also be considered, however most symptomatic recovery scales focus on positive symptoms of psychosis (Andreasen, Carpenter, Kane, Lasser, Marder, & Weinberger, 2005). Specifically within social symptoms of psychosis, social withdrawal can be conceptualised in two ways: active social withdrawal due to paranoia is classed as a positive symptom of psychosis, whereas passive social withdrawal due to low mood and self-isolation is classed as a negative symptom (Wagman, 1988),

Cross-sectional studies comparing levels of social support and symptoms at specific time-points in the course of psychosis suggest that larger social network sizes are associated with improved functional outcomes (Corrigan & Phelan, 2004; Evert, Harvey, Trauer, & Herrman, 2003; Howard, Leese, & Thornicroft, 2000; Salokangas, 1997) and lower levels of symptoms (Cohen & Sokolovsky, 1978; Cresswell, Kuipers, & Power, 1992; Palumbo, Volpe, Matanov, Priebe, & Giacco, 2015; Salokangas, 1997). A higher level of subjective social support, for example satisfaction with social support, is also linked to symptomatic remission (Dahlan et al., 2014; Faccincani, Mignolli, & Platt, 1990; Viinamaki et al., 1996).

The social network size of individuals with psychosis appears to decrease across time with duration of illness and with the number of psychiatric admissions (Buchanan, 2004; Lipton, Cohen, Fischer, & Katz., 1981). The composition of social networks also changes over the course of disease to include fewer non-family members (Erickson, Beiser, & Iacono,

1998). Subjective levels of satisfaction with support, which are lower than controls from the onset of psychosis (Gayer-Anderson & Morgan, 2013), decrease with the duration of disease (Erickson et al., 1998; Lipton et al., 1981; Neeleman & Power, 1994; Turner & Brown, 2010). Countering this, however, some research suggests that network size is maintained or even increased over the first year of diagnosis (Thorup et al., 2006).

1.3.3 Links between other factors, social support and psychosis

Duration of untreated psychosis (DUP) is associated with a deterioration in social networks and support (Gayer-Anderson & Morgan, 2013; Jeppesen et al., 2008; Kalla et al., 2002; Thorup et al., 2006). This finding is not pervasive, however, with other studies showing no such direct link between social support measures and DUP (Horan, Subotnik, Snyder, & Nuechterlein, 2006; Peralta, Cuesta, Martinez-Larrea, Serrano, & Langarica, 2005). Others hypothesise a more complex interaction effect with other variables such as unemployment or socio-economic status influencing the link between social support and DUP (Peralta et al., 2005; Reininghaus et al., 2008).

The construct of premorbid social functioning presents considerable overlap with the measurement of objective social support. The Premorbid Adjustment Scale (Cannon-Spoor, Potkin, & Wyatt, 1982) rates an individual's level and ability to maintain both peer and intimate relationships, and level of sociability. Greater impairment on these social aspects of premorbid function is associated with negative symptoms, showing stronger associations than other measures of premorbid function (Chang et al., 2013; Häfner, Nowotny, Löffler, an der Heiden, & Maurer, 1995; MacBeth & Gumley, 2008), as well as functional disability (Ayesa-Arriola et al., 2013).

Poor social and vocational functioning levels are considered to be intrinsic to psychosis: both as a potential precursor and as an impact of the illness (Birgenheir & Pepper, 2013). Measures of social and occupational functioning can also be used in defining

recovery from psychosis, ranging from achieving a certain score on a measure such as the Global Assessment of Functioning (Whitehorn, Brown, Richard, Rui, & Kopala, 2002) to achieving a daily routine indistinguishable from someone without a history of the condition (Liberman & Kopelowicz, 2005).

Recovery literature argues that client perceptions of recovery place high salience on the re-establishment of social power and control and a renewed level of social integration and identity (Bonney & Stickley, 2008). Most research measures the success of a treatment intervention in relation to the reduction of positive symptoms, however, which does not encompass these more functional outcomes (Liberman & Kopelowicz, 2005).

1.4.4 Understanding the relationship between social support and recovery from psychosis

Objective measures of social network size may be related to the onset of psychosis (Gayer-Anderson & Morgan, 2013), and larger network sizes are implicated with improved functional and clinical outcomes for psychosis (Evert et al., 2003; Salokangas, 1997). Decreased subjective satisfaction with social support may also be related to onset (Song et al., 2011) and remission (Dahlan et al., 2014) from the condition.

Although clear links exist between level of social support and prognosis of psychosis, the mechanisms that underlie this are harder to define (Buchanan, 1995). The type of symptom and length of hospitalisation or treatment may impact on an individual's social ties (Palumbo et al., 2015). The experience of negative symptoms of psychosis, including low mood and withdrawal, may act as a moderator for the inability to access social support, and the positive impact that having access to higher levels of social support may have on individuals (Evert et al., 2003; Palumbo et al., 2015). Social withdrawal can also be conceived as a positive (active withdrawal) or indeed a negative (passive withdrawal) symptom of psychosis, and recovery definitions based on alleviation of it as either a positive or a negative symptom. (Wagman, 1988). Social withdrawal may also be a helpful

behaviour in the context of toxic social network connections (Sündermann et al., 2014). Bi-directional influences such as these mean that the relationship between the two factors is difficult to understand. The impact of social support over the course of an episode of psychosis is therefore an important relationship to try to understand. The hypothesised causal effect of social support on psychosis (House, 1981; Turner & Brown, 2010), has not been thoroughly reviewed with appropriate longitudinal designs, as the majority of empirical evidence has relied on cross-sectional paradigms, rendering it difficult for etiological conclusions to be derived, (Turner & Brown, 2010).

1.4 Previous reviews on social support and symptoms of psychosis

Three recent reviews have been completed regarding social support and psychosis. In a review of the size of the social networks of individuals with psychosis, (Palumbo et al., 2015), the weighted mean size was found to be 11.7 individuals within the whole social network, and within this 3.4 individuals within friendship networks. This highlights the relatively large proportion (on average 43.1% of the whole social network) comprised of family members, when compared to the relatively lower proportion of friendships (on average 26.5% of the whole social network) that were present in these individuals' lives. Possible links between negative symptoms and social network size were also reported within this review.

A systematic review by Gayer-Anderson and Morgan (2013) reported that both social networks and support are reduced in both number of and frequency of contacts in people with early psychosis when compared to non-clinical controls. Clinical samples showed reduced social network size compared with non-clinical samples, for example mean size 3.7 versus 5.3 (Macdonald et al., 2000) and 3.6 in FEP and 6.3 in non-clinical samples (Erickson, Beiser, Iacono, Fleming, & Lin, 1989). From a subjective perspective, the review found that individuals with psychosis were also less satisfied with the social support that

they received. The review highlights that these reduced levels of social networks, and perceptions of social support, are specifically due to a deficit in friends and confidants, rather than in the availability of family members. This links with Palumbo et al. (2015)'s review findings about the structure of the social networks of these individuals. The review speculates that deficiencies in social network and social support may precede the onset of the condition, however reaches this conclusion by mostly examining cross-sectional studies at different time points rather than utilising studies exploring the same sample using a prospective design.

A qualitative synthesis of papers (Tew et al., 2011) summarised key social factors that may promote or inhibit recovery from psychosis. This conceptual review suggested from the literature that three themes were central to recovery from psychosis: empowerment and control over one's life, a rebuilding of a positive self-identity, and finally social connectedness (which included both subjective and objective constructs of social support). The review suggested that the promotion of social connectedness and social inclusion was central to the recovery process, and highlighted that subjective qualities of social relationships such as reciprocity and equality were important to facilitate recovery.

There has not yet been a quantitative analysis investigating the strength of association between social support and later prognosis of and recovery from psychosis.

1.5 Review questions

The current meta-analysis examines if baseline social support predicts symptomatic recovery as assessed by longitudinal prospective studies. Additionally, any differential level of association between subjective and objective social support on symptomatic recovery will be examined. The length of time between baseline and follow-up will also be evaluated to ascertain whether social support and recovery show a stable association over disease course.

2. Method

2.1 Literature search

A literature search was completed to identify suitable papers.

2.1.1 Search protocol

The search strategy comprised of two stages. Firstly, four bibliographic databases judged to be most suitable to the subject area were identified. These were EMBASE (1974 to November 2015), PsychINFO (1946 to November 2015), Web of Science (1900 to November 2015), and Medline (1946 to November 2015). After initial scoping searches, the databases were searched using a three-component strategy of key terms in title and abstracts (Table 2), adapted from the Gayer-Anderson and Morgan (2013) search strategy.

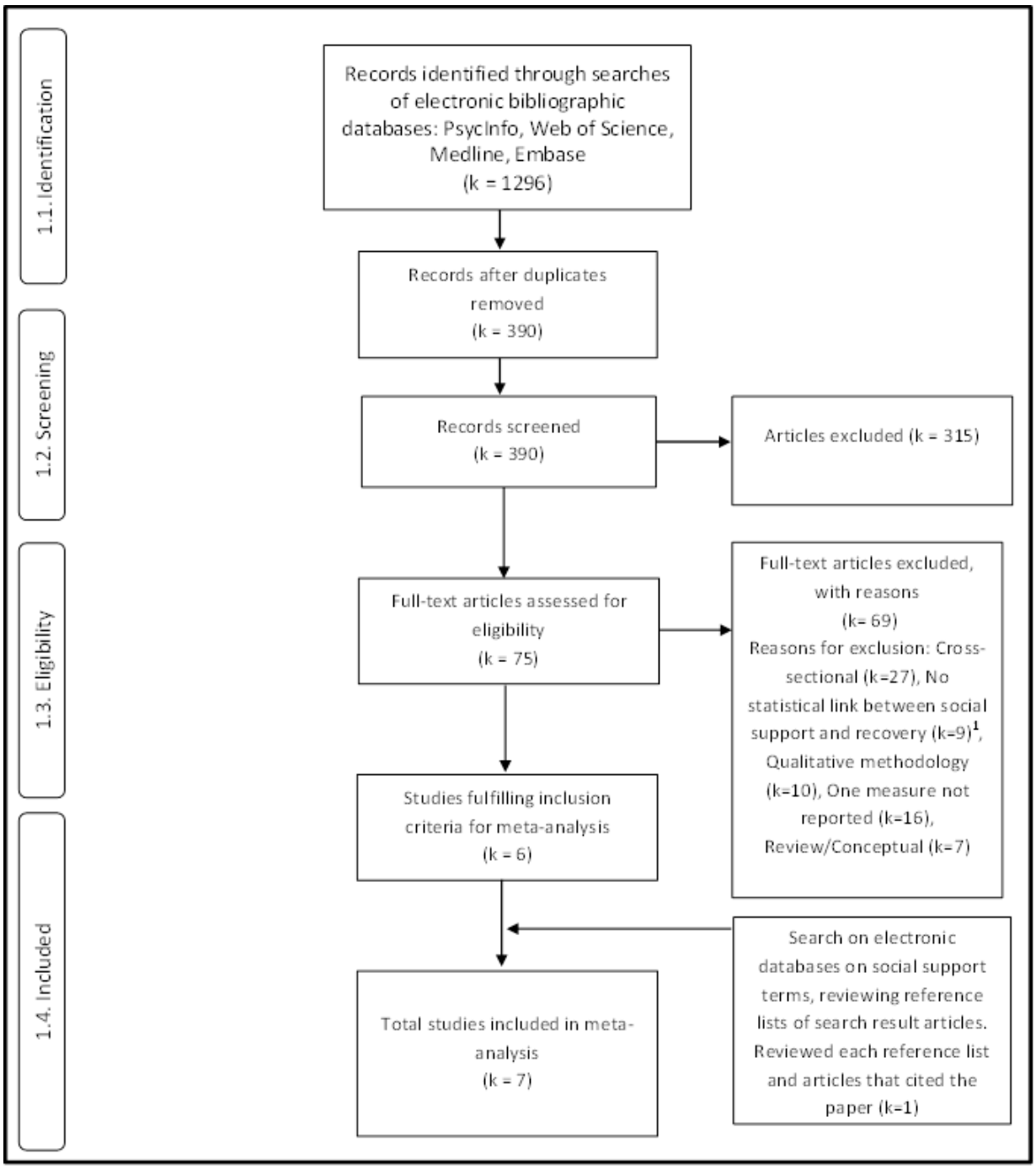
Table 2: Three-component search Strategy for Literature Search

	AND	AND
Social Network	Psychos?s	Recovery
Social Support	Schizo*	Prognosis
Social Capital	Delusion	Disease Course
Social Integration	Paranoi*	Relapse
Social Engagement		Outcome
Social Isolation		
Social Interaction		
Loneliness		

The search procedure followed Cochrane protocol for the identification of papers for systematic review (Higgins & Green, 2008), and used the software programme EndNote X5 (Reuters, 2011). Results from all databases were amalgamated, and duplicates were removed. Selected papers were then checked firstly by title, and subsequently by abstract. Papers still meeting inclusion criteria were read in the full text to ensure relevance. Secondly, the references of all included studies, and the papers which had since cited these, were hand-searched. This was repeated with the newly identified papers to determine that the literature had reached the equivalent of qualitative 'saturation'. Figure 1 shows a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram

(Moher, Liberati, Tetzlaff, & Altman, 2009) detailing the process of studies being screened for inclusion in the meta-analysis. From an initial search result of 390, the final studies included numbered just seven.

Figure 1: Flowchart of included studies



Notes: [1]k=9 studies reported relevant measures of social support without statistical link. Authors of k = 5 studies were contacted for this information (k = 4 did not include contact information on papers due to older publication dates), however information was not provided by authors.

2.1.2 Eligibility criteria

This meta-analysis included all studies published in the English language, and peer reviewed journals up to November 2015, which examined adults (18-65) with a diagnosis of psychosis.

Studies were included if they met all of the following criteria: (a) a measure of a social factor at baseline (b) a measure of psychotic symptoms at follow-up, and (c) a statistical examination of links between the two calculable by using information from the paper itself, or forthcoming from the authors on contacting them to request this additional information. To allow for the predictive relationship of social factors on the course of psychosis across time to be examined accurately, (d) only longitudinal methodologies were included.

Studies were excluded if they met any of the following exclusion criteria: the studies must not (a) include children, (b) include older adults, (c) include other mental health diagnoses, (d) include post-partum psychosis, or (e) include a veteran population.

2.1.3 Quality assessment

Included studies were assessed for quality using a quality assessment framework, based on an adapted version of the Standard Quality Assessment Criteria for Evaluating Primary Research Papers (Kmet, Lee, & Cook, 2004). This Quality Assessment Scale (QAS) includes 14 criteria to rate journal articles against between 2 (fulfilled completely) to 0 (not fulfilled at all). Three questions regarding randomisation were excluded as these were not relevant to the research methodologies being investigated. Three additional questions were instead added to the criteria to effectively incorporate the inclusion criteria for this meta-analysis: a single existing question about outcome variables was split to cover (a) "was there a validated measure of social support or isolation?" and (b) "Was there a validated measure of recovery?" In addition, (c) "Was the method of analysis a direct comparison/association

between the two variables, or part of another wider analysis e.g. a regression model?" was also added. Please see Appendix 1 for the full version of the scale (QAS) used.

2.2 Meta-Analysis

Papers that fulfilled inclusion criteria were selected for the meta-analysis.

2.2.1 Effect size computation and integration

Effect sizes were extracted between single groups of participants utilising two time points. The social factor measure was extracted at time point 1, which was defined as baseline if available or the earliest time point available if baseline information was not available). The symptom measure was extracted at time point 2. If there were multiple follow-up points, time point 2 was defined as the longest interval follow-up included within the study results.

Comprehensive Meta-Analysis Version 3 (CMA 3) (Borenstein, Hedges, Higgins, & Rothstein, 2009) was used to calculate effect sizes and run the statistical analyses. The meta-analytic model automatically weights studies based on sample size. All but one of the studies included in the meta-analysis reported correlational effects, therefore Pearson's r was selected to be the effect size metric included within the analyses. Correlation coefficients have a skewed standard error formulation, so effect sizes were transformed to Fisher's Z scores (Rosenthal, Cooper, & Hedges, 1994). In one study where a correlation was not available as an effect size (Jørgensen & Aagaard, 1988), a chi-squared test was completed with the relevant data from the results section, and this was converted to an r-family effect size (Borenstein, Hedges, & Rothstein, 2007).

Effect sizes for the association of social factors and recovery derived from multiple measures of social factor were reported in four of the included papers (Borenstein et al., 2009). The reporting of multiple effect sizes from the same study infringes the meta-analytic

principle of assuming independence between the effect sizes included. To address this, correlation coefficients were combined as recommended (Corey, Dunlap, & Burke, 1998) by transforming the individual r values to Fisher's Z scores, calculating the mean of these standardised scores, and converting back to an r value for inclusion in the meta-analysis.

In two of the included studies (Hultman, Ohman, Ohlund, Wieselgren, & Ost, 1996; Kalla, Wahlstyom, Aaltonen, Lehtinen, & Gonzalez de Chavez, 2011), statistics were reported by different participant groups (for example in different subtypes of psychosis, or in different sample populations). In these instances, the subgroups within a study were sufficiently separate populations to assume that the within-study subgroup variation applied as much as between study variation (Borenstein et al., 2009), therefore each subgroup is included within the meta-analysis model as separate data.

2.2.2 Analytic Procedure

Publication bias can cause an over-inflation of mean effect sizes, as journals tend not to publish non-significant findings. This may particularly be the case where studies include social factors as a secondary outcome, rather than their primary or sole, outcome measure. Publication bias for the study was investigated in two ways. Firstly, a funnel plot was calculated to visually examine the distribution of study sample size (standard error) against reported effect size (Fisher's Z). In the absence of publication bias, the funnel plot will show a broadly symmetrical distribution, with larger study samples gathered around the mean effect size, and a greater variability in effect size evident within the smaller study sample sizes. In addition to this check, the classical fail-safe N statistic was calculated. This statistic gives the number of studies that would need to exist showing a null finding in order for the probability of the combined effect size rendered by the meta-analysis to exceed p=0.05, thus nullifying the meta-analysis effect.

2.2.3 Heterogeneity of Effect Sizes

Heterogeneity of effect sizes was computed using the Q statistic, which approximates a chi-square distribution to ascertain whether the distribution of effect sizes around the mean is significantly greater than what would be expected from sampling error. Given the relatively low number of studies within the meta-analysis which may mean that these statistics have low power, however, it was decided a priori that a random-effects meta-analytic model should be utilised.

2.2.4 Additional Analyses

The studies included in the meta-analysis include social factors that can further be dichotomised by their underlying construct into measures of subjective and objective social support. Studies were therefore additionally coded according to whether the social factor reported was measured using a subjective or objective instrument. Within some of the studies that include more than one measure of social support, the variables included both subjective and objective aspects. R values relating to the two constructs were separated and re-calculated using the conversion to Fisher's Z method reported above, and included as categorical moderator variables. This process gave r values for the association between 4 subjective measures and 7 objective measures of social support and symptoms of psychosis, which were compared using a groups comparison method.

In addition, to ascertain any impact that length of follow-up and therefore course of psychosis had on the relationship between social support and recovery, the duration between baseline and follow-up was entered as a continuous variable. A meta-regression was then conducted, entering length of follow-up as a predictor variable.

3. Results

3.1 Description of included studies

Seven studies were included in the meta-analysis. Table 3 shows the details of the included studies, and the various uncorrected effect sizes from their results. Notably at the final stage of screening for inclusion, nine studies were excluded as although they reported on social factors and symptom levels, the statistical relationship between these was not reported in a manner that could be used for this meta-analysis, and was not available from the authors (Albert et al., 2011; Ayesa-Arriola et al., 2013; Davis & Brekke, 2014; Gaebel & Pletzcker, 1987; Horan et al., 2006; Howard et al., 2000; Hultman, Wieselgren, & Ohman, 1997; Prudo & Blum, 1987; Salokangas, 1997).

3.1.1 Participants, demographic and methodological factors

All seven studies included within the meta-analysis were conducted in developed countries. Four of the studies were conducted in Scandinavia, with two based in Denmark (Jeppesen et al., 2008; Jørgensen & Aagaard, 1988), one in Sweden (Hultman et al., 1996) and one with part of the sample taken from Finland, compared with a sample from Spain (Kalla et al., 2011). One study was conducted in Canada (Norman et al., 2005), one in Hong Kong (Chang et al., 2013), and the remaining study in the UK (Tempier, Balbuena, Lepnurm, & Craig, 2013).

Scores on the QAS ranged from 18 (Jørgensen & Aagaard, 1988) to 24 (Jeppesen et al., 2008) of a possible 26 points; QAS scores are included in Table 3. Higher scoring studies utilised more extensive or validated measures of social support and recovery, and reported their findings more fully and in context. The lowest score of 18 was not judged to be sufficiently sub-standard to exclude, therefore all studies were included in further analysis.

Table 3: Key characteristics of studies included in meta-analysis

Study	Country	Time period	Cohort Start Year	Primary participant group (n)	Mean age of participants (SD)	Measure of Social Support	Subjective or Objective Social Support Measure	Measure of recovery	Effect size(s)	QAS score
Jeppesen et al (2008)	Denmark	2 years	1998	First Episode Psychosis (294)	26.8 (SD 6.4)	PAS – social index	Objective	SAPS and SANS	SAPS: 1 year 0.099, 2 years 0.092 SANS: 1 year 0.248, 2 years 0.153	24
Norman et al (2005)	Canada	3 years	1997	First Episode Psychosis (102 or 112)	25.8 (no SD given)	WQL-P (3 components)	Subjective	SAPS and SANS	3 years: SAPS -0.30, SANS -0.16	24
Chang et al (2013)	Hong Kong	3 years	1997	First Episode Psychosis (87)	31.1 (SD 9.7)	PAS – social index	Objective	HENS	PAS and HENS at 3 years: 0.225	23
Tempier et al (2013)	UK	18 months	2000	Early Episode Psychosis (123)	26.3 (SD 6.1)	SOS	Subjective	Systematic chart review method, including use of PANSS	Support and remission at 18 months: 0.26	23
Kalla et al (2011)	Finland and Spain	1 year	1992 (Finland) 1997 (Spain)	First Episode Psychosis (68)	Finland 27.1 (SD 6.5), Spain 28.0 (SD 6.9)	Semi-structured interview on interpersonal relations	Objective	BPRS	Finland weak social network 0.51, few social contacts with friends 0.30 Spain weak social network 0.29, few social contacts with friends 0.37	20
Hultman et al (1996)	Sweden	Up to 4 years	Not stated (1980s)	DSM-III diagnosed schizophrenia (n=42 at start of study, n=30 for statistical analysis)	33 (SD 6.4)	ISSI	Subjective and Objective	CPRS	Social integration of ISSI: *Remission group* (n=16) perceived symptoms: availability of social integration -0.62, adequacy of social integration -0.56. Observed symptoms: availability of social integration -0.25, adequacy of social integration 0.29. *Relapse group (*n=14) perceived symptoms: availability of social integration -0.51, adequacy of social integration -0.02. Observed symptoms: availability of social integration -0.7, adequacy of social integration 0.16.	19
Jorgensen and Aagaard (1988)	Denmark	2 years	1984	First Admission Psychosis (88)	39 (no SD given)	Number of social contacts per month	Objective	Clinician rating: (good outcome is total absence of psychotic symptoms, no impairment, no remission, no relapse)	Correlation calculated via chi squared. Variables dichotomised into 'Few contacts' and 'Some contacts', and compared with binary 'psychotic symptoms' or 'no psychotic symptoms'. $Chi^2 = 9.5767$, $p = 0.001971$	18

Notes: PAS = Premorbid Adjustment Scale, HENS = High Royds Evaluation of Negativity Scale , SAPS = Scale for the Assessment of Positive Symptoms, SANS = Scale for the Assessment of Negative Symptoms, WQL-P = Wisconsin Quality of Life-Provider Questionnaire, SOS = Significant Others Scale, PANSS = Positive and Negative Symptoms Scale, GAF = Global Assessment of Functioning, ISSI = Interview Schedule for Social Interaction, CPRS = Community Psychiatric Rating Scale, BPRS = Brief Psychiatric Ratings Scale

Studies ranged from examining a relatively modest sample size of 30 participants (Hultman et al., 1996) to much larger sample sizes of 294, for example Jeppesen et al. (2008), and scores on the QAS were awarded accordingly.

All but two of the studies used a sample population with First Episode or Early Episode Psychosis, and the age of participants was typical for this index population (mean age for these six studies was 27.5 years) (Chang et al., 2013; Jeppesen et al., 2008; Kalla et al, 2011; Norman et al., 2005; Tempier et al., 2013). Chang et al. (2013)'s study yielded a slightly older mean age (31.1), possibly reflective in differences in services in Hong Kong. These seven studies drew participants from both inpatient and outpatient psychiatric services in a certain geographical area. Two of these studies (Jeppesen et al., 2008; Tempier et al., 2013) utilised participants from a larger study population. The remaining two studies that did not use a FEP or Early Episode Psychosis sample had older average participant groups (Hultman et al., 1996; Jørgensen & Aagaard, 1988). Here, samples were drawn only from inpatient psychiatric services. Jørgensen and Aagaard (1988) utilised First Admission patients (meaning that these individuals may have experienced psychosis in an outpatient setting previously), with a mean age of 39 years, and Hultman et al. (1996) reported on inpatients with a DSM-III (American Psychological Association, 1980) diagnosis of schizophrenia (with a mean age of 33 years). These studies were therefore rated lower on the Quality Assessment Score than the other studies.

All studies included in this meta-analysis, as specified a priori, employed a longitudinal methodology. Time between initial baseline measures of social support and outcome measures of recovery varied between a one year interval (Kalla et al., 2011) and a four year interval (Hultman et al., 1996).

3.1.2 Baseline measures of social support

Studies utilised a mixture of validated and non-validated measures of baseline social support, and higher scores on the QAS were awarded for appropriate and validated measures. Only one of the studies, Tempier et al. (2013), used self-report as a method of data collection for baseline social support, utilising the Significant Others Scale (Power, Champion, & Aris, 1988) to gauge perceived actual and ideal levels of social support. All other studies used interviews by clinical professionals to rate levels of social support.

Perceived social support, as measured by the Significant Others Scale (Tempier et al., 2013), and aspects of the Interview Schedule for Social Interaction (ISSI) (Hultman et al., 1996), allowed participants to determine how they experienced the social support systems surrounding them, and their satisfaction with these. The Quality of Life measure used in Norman et al. (2005) (Becker & Diamond, 1999) was deemed to be a subjective instrument of social support, as the components of the questionnaire utilised in the results investigated perceived quality of support from friends and family, and perceived effort that the individual made in their own social relationships. All of the other studies, as well as the other, objective aspects of the ISSI measured objective social support. The Social Adaptation component of the Premorbid Adjustment Scale (Cannon-Spoor et al., 1982), was used by Jeppesen et al. (2008) and Chang et al. (2013). This contrasts to more simplistic and non-validated measures, such as simply the number of social contacts per month (Kalla et al., 2011), or a structured interview on interpersonal relations (Jørgensen & Aagaard, 1988).

3.1.3 Outcome measures of symptomatic recovery

Similar to the baseline measures, outcome measures of symptoms of psychosis were reported using several different criteria. All studies used clinician rated scales to measure levels of symptoms for their outcome measure. Some of the studies (Jeppesen et al., 2008; Norman et al., 2005; Tempier et al., 2013) utilised measures that split symptoms into

positive and negative dimensions such as the SAPS/SANS and PANSS (Andreasen, 1984; Kay, Flszbein, & Opfer, 1987). Chang et al. (2013) only reported correlation of negative symptoms utilising the HENS (Mortimer, McKenna, Lund, & Mannuzza, 1989). Others (Hultman et al., 1996; Kalla et al., 2011) used diagnostic tools that gave a single measure of overall symptomatology such as the CPRS (Åsberg, Perris, Schalling, & Sedvall, 1978) and the BPRS (Lukoff, Nuechterlein, & Ventura, 1986). Manual for the expanded brief psychiatric rating scale. *Schizophr Bull*, *12*, 594-602.. Jørgensen and Aagaard (1988)'s study used an entirely non-validated point of view, employing clinician's ratings of whether or not they felt that their patients had recovered, whereas Tempier et al. (2013) combined both the validated PANSS with an additional systematic chart review method to give a full description of recovery.

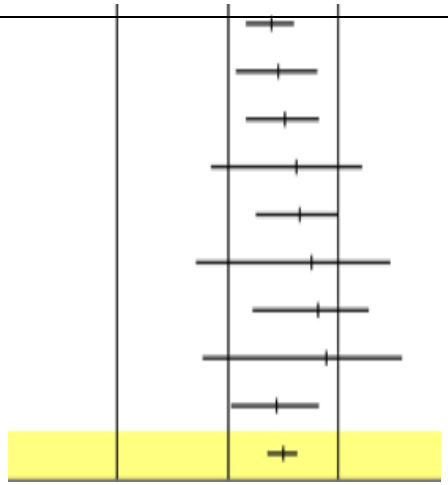
3.2 Meta-analysis

3.2.1 Meta-analytic model

Please note that results are reported in Pearson's r values for ease of understanding.

Table 4 shows the correlations or pooled correlations of each study or study sub-sample and standard errors, as entered into the meta-analysis. As can be seen, 9 different samples were entered into the meta-analysis, with a total of 792 participants.

Table 4: Correlation and key statistics of each study as entered into the meta-analysis

Study sample/sub-sample	n	r	SE	95% CI	Z	r and 95% CI -0.5 0 0.5
Jeppesen (2008)	294	0.2	0.06	0.09 to 0.31	3.49	
Norman (2005)	102	0.23	0.10	0.04 to 0.41	2.34	
Tempier (2013)	123	0.26	0.09	0.09 to 0.42	2.92	
Kalla (2011) Spain sub-sample	28	0.31	0.18	-0.07 to 0.61	1.61	
Jorgensen (1988)	88	0.33	0.10	0.13 to 0.5	3.16	
Hultman (1996) relapse sub-sample	16	0.38	0.24	-0.14 to 0.74	1.45	
Kalla (2011) Finland sub-sample	40	0.41	0.14	0.11 to 0.64	2.66	
Hultman (1996) remission sub-sample	14	0.45	0.24	-0.11 to 0.79	1.59	
Chang (2013)	87	0.23	0.10	0.02 to 0.42	2.10	
Random effects	792	0.26		0.19 to 0.32	7.16	

Notes: n = total sample size, r = effect size, SE = standard error of correlations, 95% CI = the upper and lower limits of 95% confidence intervals for uncorrected correlations, Z = standardised score

The meta-analysis (summary statistics are shown in Table 5) showed that the aggregate random effects estimate for the relationship between social support at the baseline time-point, and symptoms of psychosis at a later time-point was r = 0.26 (95% CI = 0.19 to 0.32; Z = 7.16; p < 0.001). This exceeds Cohen's criteria for a small but significant positive effect size (Cohen, 1992). This suggests that a higher level of social support is related to a lower level of psychosis symptomatology at a later point in time. Heterogeneity testing gave the Q value as 3.653, p = 0.89, meaning that the effect sizes were not significantly greater than expected from sampling error. This Q statistic was utilised to calculate I^2, giving the total variance attributable to between-study variance. I^2 = -119.0. When I^2 is a negative value, it is assumed to be equivalent to 0 (Borenstein et al., 2007). This therefore suggests that variance observed was not attributable to between-study variance.

Table 5: Meta-analyses of association between social factors and symptoms of psychosis (including subjective and objective measures of social factors

Random effects model	k	n	Mean effect size r	95% CI	Z	P
All studies	9	792	0.26	0.19 to 0.232	7.16	<.001***
Subjective measures[1]	4	255	0.27	0.15 to 0.38	4.27	<.001***
Objective measures[2]	7	567	0.25	0.17 to 0.33	6.07	<.001***

Notes: k = number of studies, n = total sample size, r = average uncorrected correlation, 95% CI = the upper and lower limits of 95% confidence intervals for uncorrected correlations, p = average correlation.
1. Subjective studies: Hultman et al. (1996) remission and relapse groups subjective measures; Norman et al (2005); Tempier et al. (2013). 2. Objective studies: Jorgensen et al. (1988); Hultman et al. (1996) remission and relapse groups objective measures; Jeppesen et al. (2008); Kalla et al. (2011) Spain and Finland sub-samples; Chung Chang et al (2013).

3.2.2 Additional analyses

As specified a priori, additional analyses of whether social support being measured in a subjective or objective manner were investigated. This involved splitting social support r values for each study into subjective and objective measures of social support and pooling these where necessary to create an aggregate correlation (Hultman et al., 1996). These were then entered into two separate meta-analyses. Subjective measures of support alone

had a marginally higher Z value than objective measures of social support, however both still gave statistically significant aggregate correlations and were therefore similar to the meta-analytic model including both of these measures combined.

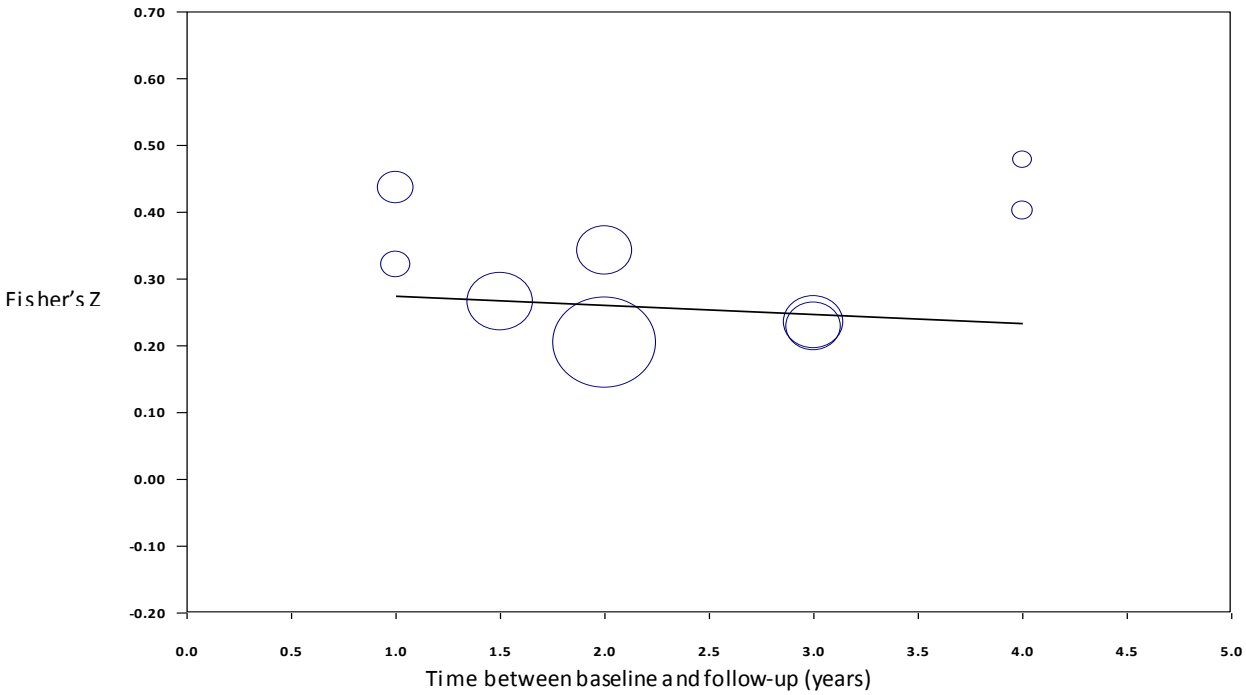
The effect of duration from baseline to follow-up was investigated utilising a meta-regression, entering time (in years) between social support measure and recovery measure as the predictor variable. As can be seen in Table 6 and Figure 2, time was not found to significantly predict relationship between social support and recovery (r = -.013, Z = -.26, p = .80).

Table 6: Meta-regression statistics

Moderator variable	Coefficient	SE	95% Lower CI	95% Upper CI	Z-value	P-value
Year to follow-up	-0.0137	0.053	-0.1176	0.0903	-0.26	0.7967

Notes: Coefficient = regression coefficient, SE = standard error of regression, 95% CI = the upper and lower limits of 95% confidence intervals, Z = regression coefficient divided by its standard error, P = statistical significance of prediction of regression coefficient (non-significant).

Figure 2: Meta-regression of length of time between baseline and follow-up and strength of association between social support and symptomatic recovery



3.2.3 Publication bias

Visual examination of the funnel plot from included studies showed broadly a symmetrical distribution; one of the studies (Hultman et al., 1996) appeared lower on the right-hand side compared to the other studies due to its relatively small sample size, however it had a comparable effect size to other studies. There is, however, significant debate regarding the suitability of funnel plots in ascertaining publication bias. In addition, therefore, the classical Fail-safe N statistic showed that 110 non-significant studies would be required to conclude an overall non-effect of the meta-analyses, suggesting that findings were extremely unlikely to be due to publication bias.

4. Discussion

4.1 Findings of the meta-analysis

This meta-analysis sought to investigate whether there was an association between level of social support in early psychosis, and symptomatic recovery at a later point in time, and quantify any aggregate effect size discovered. To the author's knowledge it is the first review to explore a quantitative, longitudinal relationship between these two variables. The aggregate effect size was observed to be small yet significant, suggesting that higher levels of social support at an earlier point in the course of psychosis (mainly within First Episode or Early Episode samples), may predict lower levels of symptoms of psychosis (i.e. symptomatic recovery) at a later point in time.

The manner in which the social support was measured did not appear to significantly impact on the strength of this association; both subjective and objective measures of social support were associated with symptomatic outcome. Although this contrasted with evidence suggesting that subjective social support displays stronger links with recovery than objective measures of social support (Turner & Brown, 2010), it is important to note that the

majority of studies included in this review utilised objective social support measures, and therefore the number of subjective subgroup of studies was very low.

The length of time between baseline and follow-up did not moderate the strength of association between social support and recovery, which suggests that any association may be stable over time. The small number of studies included in the meta-analysis, however, makes it difficult to draw firm conclusions about this pattern.

Tentative interpretations are put forward to account for the relationship between social support and recovery from psychosis.

4.2 Mechanisms of social support and recovery from psychosis

This meta-analysis set out to determine whether social support and symptomatology were linked, and to hypothesise the direction of that link. Research into this facet of psychosis is challenging: the psychiatric symptoms integral to the condition negatively impact on an individual's social support and vice versa, meaning that the relationship between the two variables is a dynamic one (Buchanan, 1995).

Supportive social contact at the onset of psychosis is proposed to act as a buffer against distress caused by initial experience of anomalous experiences, as well against inferring external causality from these unusual experiences (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002; Hodges, Byrne, Grant, & Johnstone, 1999). Experiencing symptoms of psychosis such as paranoia or persecutory delusions may cause an individual to self-isolate, reducing the perceived threat of harm. However, this safety behaviour serves to reinforce the threat belief, perpetuating symptoms of psychosis and decreasing the likelihood of symptomatic remission (Freeman, 2007).

Although empirical papers treat higher levels of social support (particularly objective measures such as a larger social network size) as a unilaterally positive trait (Horan et al., 2006), social networks can be toxic, and social interactions perceived as stressful (Buchanan,

1995). Heightened levels of negative symptoms, including social withdrawal, may in fact serve as a protective mechanism to shield an individual with damaged social skills from unhelpful or frightening social interactions (Cresswell et al., 1992).

The stress-buffering effect of social support is suggested to indirectly aid recovery by combatting the negative effect of stressful life events, including those experienced during psychosis such as hospitalisation, relationship breakdown and financial hardship (Buchanan, 1995). Thus, higher levels of social support at onset may mediate the impact of these stressors and increase the chance of remission. Comprehensive detail is not provided in the studies, and this review did not examine information regarding aversive childhood experiences, or current environment (Allardyce & Boydell, 2006; Varese et al., 2012), which could interact with social support to influence the likelihood of recovery (Buchanan, 1995).

Finally, from a social recovery perspective, low levels of social support or social capital may prevent an individual from accessing services, individuals or situations that promote holistic, including symptomatic, recovery (De Silva, McKenzie, Harpham, & Huttly, 2005; Tew et al., 2011).

Future analysis examining the longitudinal relationship of symptomatology at baseline and social support at follow-up, or assessing associations at multiple time-points, would allow comparison with the present review to better understand any directionality of the effect. Well-designed case control studies may also allow causal inferences to be made (Susser, Schwartz, Morabia, & Bromet, 2006), which could meaningfully contribute further to the literature base.

4.3 Other factors in recovery from psychosis

Beyond possible mechanisms between social support and recovery, the relatively small effect size found in this meta-analysis suggests that the majority of the variance may be explained by additional factors. Before onset of psychosis, for example, individuals may

have experienced differing lengths of DUP (Marshall et al., 2005) which has a large impact on likelihood of remission. During the follow-up period, sample cohorts will have experienced different treatment options due to differences in treatment methods between areas or countries; for example the Early Intervention treatment available in Scandinavian countries is advanced (Bertelsen et al., 2008) whereas in Hong Kong Early Intervention for Psychosis services are only recently emerging (Chen et al., 2011; Harrison et al., 2001). Different degrees of treatment efficacy may thus impact on the level of symptomatic remission (Menezes et al., 2006).

4.4 Limitations

4.4.1 Methodological limitations

The conclusions derived from this review are necessarily tentative due to the small number of studies included in the meta-analysis, and the heterogeneity of their methodologies.

The literature search had a number of limitations. With regards to exclusion criteria, papers not written in the English language were not included due to lack of resource for translation. Qualitative papers which may have noted longitudinal links between social support and symptomatology were also not included, as the meta-analysis warranted a statistical link that these papers did not provide. It is acknowledged that these exclusions may have resulted in the loss of rich and relevant information.

The decision to only include longitudinal studies was taken to control for temporal order of predictor and outcome required for a causal relationships in a field where the majority of research utilises a cross-sectional designs. However, it is critical to note that although there is a temporal relationship between the two variables, this does not guarantee causality. The relationship may be cyclical rather than linear. Individuals already held a psychosis diagnosis when baseline levels of social support were recorded within

studies; suggesting that underlying illness processes could have already impacted on social support (Gayer-Anderson & Morgan, 2013). Social withdrawal - construed in itself as a positive or negative symptom of psychosis - may further confound a definite directionality of relationship (Wagman, 1988). Non-clinical comparisons and studies investigating At Risk Mental State suggest that social support and social networks are decreased before the onset of symptoms, however this finding is not universal (Gayer-Anderson & Morgan, 2013). Other covarying processes may have interacted with the two variables to alter the outcomes. Cohort studies which conduct baseline measures before any onset of psychosis would allow a more accurate understanding of the timeline of these variables to be understood.

Social support is frequently a secondary measure within empirical paradigms investigating psychosis, which are often focussed on the effect of medication or psychological intervention (Leff, 2008). Terms describing social support may thus not be included in research titles or abstracts. The literature search identified nine further studies excluded as although reporting the relevant longitudinal data, they did not report a direct statistic relating baseline social support and later symptom levels of psychosis (and this information when requested could not be obtained directly from the authors) (Albert et al., 2011a; Ayesa-Arriola et al., 2013; Davis & Brekke, 2014; Gaebel & Pletzcker, 1987; Horan et al., 2006; Howard et al., 2000; Hultman et al., 1997; Prudo & Blum, 1987; Salokangas, 1997).

In the context of the meta-analysis, it is acknowledged that these additional studies may have influenced the combined effect size. However, it is unlikely that the addition of missing studies would surpass the Fail-Safe N statistic, which reported that 110 non-significant studies would be necessary to counter the significant level of the aggregate correlation.

Nine samples belonging to seven studies fulfilled inclusion criteria for the meta-analytical model. There was significant variability between studies. Importantly, the

majority of the studies took place in Scandinavian countries, meaning that results may not be generalisable to other cultures with different attitudes to mental health or availability of mental health service. The time interval between baseline and follow-up was relatively short (between one and four years), meaning that any differential effects of low social support at onset and over the course of the condition may not yet have been entrenched (Buchanan, 1995).

Included studies utilised a range of both validated and non-validated methods of measurement of social support and symptomatic recovery. Potential information bias from the use of study-specific, non-validated measures in some of the included studies that cannot be assumed to show good reliability also limits any conclusions drawn. The studies showed heterogeneity of sample sizes (ranging from 30 to 294) and included both diagnoses of First Episode Psychosis outpatient and inpatient psychosis cohorts. Selection bias due to the nature of the samples (individuals with psychosis who had presented to services) reported upon may further confound results.

4.4.2 Conceptualisation of social support

The strength of conclusion drawn from this meta-analysis is impacted by the heterogeneity of measures used within different studies. Social support is widely defined and assessed in the literature (Turner & Brown, 2010), including within the studies examined in this meta-analysis. To manage this variation, this review drew on previous literature (Cobb, 1976; Pearlin, 1985) and split measurements of social support into subjective and objective subgroups. Previous literature has shown stronger links between perceived social support (which would be identified more within the subjective social support variables) than received social support (which would be identified more within objective social support variables): an effect that was not replicated within this meta-analysis (Cohen et al., 2000). Within these subsets of subjective and objective social support measures, however,

heterogeneity occurred. In the case of subjective social support, measures included the actual and ideal levels of emotional and practical support yielded from Significant Others (Tempier et al., 2013), questions about the adequacy of support from friends and family (Hultman et al., 1996), and the perceived reciprocity of relationships (Norman et al., 2005). Larger contrasts existed in the constructs underlying objective measures of social support; from total network contacts in one month (Jorgensen & Aagaard, 1988) to clinician assessed social network including details of friends and family contacts (Chang et al., 2013; Jeppesen et al., 2008).

The finding that there was no difference between these subgroups may suggest that social support is linked to symptomatic recovery regardless of whether objective or social measures are utilised. However it is also plausible that several underlying constructs measured by subjective and objective social support measures relate to different mechanisms that mediate social support and recovery (Cohen, 2004). The literature search did not identify studies examining other constructs of social support, for example social capital (Kawachi & Berkman, 2001). Prior to psychosis onset, a period of functional decline occurs which may affect levels of social support at diagnosis (Gayer-Anderson & Morgan, 2013), thus influencing experience of social support. The effects of this functional decline may also render patients' subjective reports of social support inaccurate (Tempier et al., 2013). The lack of difference between subjective and objective measures may also be due to the sub-groups' low internal consistency, as well as small statistical power.

4.4.3 Conceptualisation of recovery from psychosis

Akin to social support, although the meta-analytic protocol necessitated clear classification of symptomatic recovery, measures utilised by the included studies were not entirely uniform. Recovery was measured through the remission of positive and negative symptoms on four different symptoms scales (SAPS/SANS, PANSS, BPRS and CPRS); reporting

only levels of negative psychotic symptoms (Chang et al., 2013); and utilising non-validated clinician rating techniques (Jorgensen & Aagaard, 1988; Tempier, Balbuena, Garety, & Craig, 2012).

Symptomatic recovery is only one aspect of recovery from psychosis (Liberman & Kopelowicz, 2005); the concept of functional recovery is also crucial. These two constructs show associations but are not equivalent; individuals may be considered recovered on one or other of the domains (Corrigan & Phelan, 2004). Perceptions of recovery from those with lived experience of psychosis suggest that the more salient aspects of the concept are functional and social. Similar longitudinal links between social support and functional recovery are found in the literature (Ayesa-Arriola et al., 2013; Erickson et al., 1998; Erickson, Beiser, Iacono, Fleming, & Lin, 1989), however these findings have not yet been systematically reviewed.

4.5 Clinical implications

Although the meta-analysis effect size accounts for a relatively small amount of the total variance, the finding is important. Social support is a domain that can be influenced contemporaneously by treatment intervention whereas other factors, such as gender (Ochoa et al., 2012) or childhood adversity (Bentall et al., 2014; Varese et al., 2012), that are implicated with recovery from psychosis cannot. This review therefore lends weight to the need for intervention that specifically improves levels of social support.

Family intervention has been proven to improve outcomes in psychosis (Lam, 1991; Stephen Pilling, Bebbington, Kuipers, Garety, Geddes, Orbach, et al., 2002) and is listed in current NICE guidance as a recommended treatment for schizophrenia (NICE, 2014). Given the potential loss and low proportion of non-kin contacts in the social support structures of individuals with psychosis, interventions specifically tailored at improving these relationships may also help to boost prognosis (Buchanan, 1995).

Social skills training (SST) aims to reduce isolation and social withdrawal within psychosis through modelling and role-playing techniques. NICE do not currently recommend social skills interventions due to a heterogeneity of findings of their efficacy (Steven Pilling, Bebbington, Kuipers, Garety, Geddes, Martindale, et al., 2002), however more recent evidence suggests that this style of intervention has good outcomes for psychosocial function (Kurtz & Mueser, 2008). One difficulty in effective evaluation of social skills training is a lack of defined protocol in the different interventions offered (Bellack, 2004). Social participation interventions, which aim to boost the levels of social support experienced by individuals with mental health problems through factors such as asset-based approaches, social skills development, building trusting relationships between workers and service users, and resource finding to enhance community participation, share this methodological heterogeneity which again renders empirical testing to prove their efficacy more challenging (Newlin, Webber, Morris, & Howarth, 2015). It may be that these interventions help to challenge individuals' paranoid beliefs about the social world; indeed meta-cognitive training interventions include domains specific to this subject matter and are efficacious (Moritz et al., 2014). The experience of connecting with other people within these social-based interventions, which are often group-based, may also increase social integration and allow social connectedness and opportunities for social support to increase (Brissette et al., 2000).

Building on the evidence base will help to further explore and infer causality between the complex concepts of social support and recovery from psychosis. This may be achieved not simply through new, robustly designed prospective research, but also through the encouragement of current researchers to report findings on social support, even if a secondary measure (Leff, 2008) Looking closely at specific mechanisms of social support by utilising experimental paradigms that allow links to be examined in isolation may further illuminate the directionality and mechanism of social support on recovery from psychosis.

5. References

Albert, N., Bertelsen, M., Thorup, A., Petersen, L., Jeppesen, P., Le Quack, P., . . . Nordentoft, M. (2011a). Predictors of recovery from psychosis: Analyses of clinical and social factors associated with recovery among patients with first-episode psychosis after 5 years. *Schizophrenia Research, 125*(2-3), 257-266.

Albert, N., Bertelsen, M., Thorup, A., Petersen, L., Jeppesen, P., Le Quack, P., . . . Nordentoft, M. (2011b). Predictors of recovery from psychosis: Analyses of clinical and social factors associated with recovery among patients with first-episode psychosis after 5 years. *Schizophr Res, 125*(2-3), 257-266.

Allardyce, J., & Boydell, J. (2006). Environment and schizophrenia: review: The wider social environment and schizophrenia. *Schizophrenia Bulletin, 32*(4), 592-598.

American Psychiatric Association. (1980). Diagnostic and statistical manual of mental disorders (3rd ed., text rev.). Washington, DC:

Andreasen, N., Carpenter Jr, William., Kane, J., Lasser, R., Marder, S., & Weinberger, D. (2005). Remission in Schizophrenia: Proposed Criteria and Rationale for Consensus. *American journal of Psychiatry, 162*(3), 441-449. doi: doi:10.1176/appi.ajp.162.3.441

Andreasen, N. C. (1984). *Scale for the Assessment of Positive Symptons:(SAPS)*: University of Iowa.

Andreasen, N. C., Nopoulos, P., Schultz, S., Miller, D., Gupta, S., Swayze, V., & Flaum, M. (1994). Positive and negative symptoms of schizophrenia: past, present, and future. *Acta psychiatrica Scandinavica. Supplementum, 384*, 51-59.

Åsberg, M. E., Perris, C. E., Schalling, D. E., & Sedvall, G. E. (1978). CPRS: Development and applications of a psychiatric rating scale. *Acta Psychiatrica Scandinavica*.

Ayesa-Arriola, R., Rodríguez-Sánchez, J. M., Pérez-Iglesias, R., González-Blanch, C., Pardo-García, G., Tabares-Seisdedos, R., . . . Crespo-Facorro, B. (2013). The relevance of cognitive, clinical and premorbid variables in predicting functional outcome for individuals with first-episode psychosis: a 3 year longitudinal study. *Psychiatry research, 209*(3), 302-308.

Bebbington, P. E., Craig, T., Garety, P., Fowler, D., Dunn, G., Colbert, S., . . . Kuipers, E. (2006). Remission and relapse in psychosis: operational definitions based on case-note data. *Psychological Medicine, 36*(11), 1551-1562.

Becker, M. A., & Diamond, R. (1999). Wisconsin Quality of Life Index (W-QLI): a multidimensional model for measuring quality of life. *Journal of Clinical Psychiatry, 60*(3), 29.

Bellack, A. S. (2004). Skills training for people with severe mental illness. *Psychiatric Rehabilitation Journal, 27*(4), 375.

Bentall, R. P., de Sousa, P., Varese, F., Wickham, S., Sitko, K., Haarmans, M., & Read, J. (2014). From adversity to psychosis: pathways and mechanisms from specific adversities to specific symptoms. *Social Psychiatry and Psychiatric Epidemiology, 49*(7), 1011-1022.

Bentall, R. P., & Fernyhough, C. (2008). Social predictors of psychotic experiences: specificity and psychological mechanisms. *Schizophrenia Bulletin, 34*(6), 1012-1020.

Berkman, L. F., & Glass, T. (2000). Social integration, social networks, social support, and health. *Social epidemiology, 1*, 137-173.

Berry, K., Barrowclough, C., & Wearden, A. (2007). A review of the role of adult attachment style in psychosis: unexplored issues and questions for further research. [Review]. *Clin Psychol Rev, 27*(4), 458-475. doi: 10.1016/j.cpr.2006.09.006

Berry, K., Barrowclough, C., & Wearden, A. (2008). Attachment theory: a framework for understanding symptoms and interpersonal relationships in psychosis. [Multicenter Study

Research Support, Non-U.S. Gov't
Validation Studies]. *Behav Res Ther, 46*(12), 1275-1282. doi: 10.1016/j.brat.2008.08.009
Bertelsen, M., Jeppesen, P., Petersen, L., Thorup, A., Øhlenschlæger, J., le Quach, P., . . . Nordentoft, M. (2008). Five-year follow-up of a randomized multicenter trial of intensive early intervention vs standard treatment for patients with a first episode of psychotic illness: the OPUS trial. *Archives of General Psychiatry, 65*(7), 762-771.
Birgenheir, D. G., & Pepper, C. M. (2013). Social functioning across the course of schizophrenia. *Current Psychiatry Reviews, 9*(4), 284-292.
Bonney, S., & Stickley, T. (2008). Recovery and mental health: a review of the British literature. *Journal of psychiatric and mental health nursing, 15*(2), 140-153.
Borenstein, M., Hedges, L., & Rothstein, H. (2007). Meta-analysis: Fixed effect vs. random effects. *Meta-Analysis. com*.
Borenstein, M., Hedges, L. V., Higgins, J., & Rothstein, H. R. (2009). *Front matter*: Wiley Online Library.
Bowlby, J. (1969). Attachment and loss, volume i: Attachment.
Boydell, J., Van Os, J., McKenzie, K., Allardyce, J., Goel, R., McCreadie, R. G., & Murray, R. M. (2001). Incidence of schizophrenia in ethnic minorities in London: ecological study into interactions with environment. *Bmj, 323*(7325), 1336.
Bozikas, V. P., & Andreou, C. (2011). Longitudinal studies of cognition in first episode psychosis: a systematic review of the literature. *Australian and New Zealand Journal of Psychiatry, 45*(2), 93-108.
Brissette, I., Cohen, S., & Seeman, T. E. (2000). Measuring social integration and social networks. *Social support measurement and intervention: A guide for health and social scientists*, 53-85.
Buchanan. (1995). Social support and schizophrenia: a review of the literature. *Archives of psychiatric nursing, 9*(2), 68-76.
Buchanan, A. (2004). Political liberalism and social epistemology. *Philosophy & public affairs, 32*(2), 95-130.
Cannon-Spoor, H. E., Potkin, S. G., & Wyatt, R. J. (1982). Measurement of premorbid adjustment in chronic schizophrenia. *Schizophrenia Bulletin, 8*(3), 470.
Cantor-Graae, E. (2007). The contribution of social factors to the development of schizophrenia: a review of recent findings. *Canadian Journal of Psychiatry, 52*(5), 277.
Chang, W. C., Tang, J. Y. M., Hui, C. L. M., Wong, G. H. Y., Chan, S. K. W., Lee, E. H. M., & Chen, E. Y. H. (2013). The relationship of early premorbid adjustment with negative symptoms and cognitive functions in first-episode schizophrenia: a prospective three-year follow-up study. *Psychiatry Research, 209*(3), 353-360.
Chen, E. Y., Tang, J. Y., Hui, C. L., Chiu, C. P., Lam, M. M., Law, C. W., . . . Tso, S. (2011). Three-year outcome of phase-specific early intervention for first-episode psychosis: a cohort study in Hong Kong. *Early Intervention in Psychiatry, 5*(4), 315-323.
Cobb, S. (1976). Social support as a moderator of life stress. *Psychosomatic medicine, 38*(5), 300-314.
Cohen, & Sokolovsky, J. (1978). Schizophrenia and social networks: ex-patients in the inner city. *Schizophrenia Bulletin, 4*(4), 546.
Cohen, J. (1992). A power primer. *Psychological bulletin, 112*(1), 155.
Cohen, J. L., Lakey, B., Tiell, K., & Neeley, L. C. (2005). Recipient-provider agreement on enacted support, perceived support, and provider personality. *Psychological assessment, 17*(3), 375.
Cohen, S. (2004). Social relationships and health. *American psychologist, 59*(8), 676.
Cohen, S., Underwood, L. G., & Gottlieb, B. H. (2000). *Social support measurement and intervention: A guide for health and social scientists*: Oxford University Press.

Corey, D. M., Dunlap, W. P., & Burke, M. J. (1998). Averaging correlations: Expected values and bias in combined Pearson rs and Fisher's z transformations. *The Journal of general psychology, 125*(3), 245-261.

Corrigan, P. W., & Phelan, S. M. (2004). Social support and recovery in people with serious mental illnesses. *Community Mental Health Journal, 40*(6), 513-523. doi: 10.1007/s10597-004-6125-5

Cresswell, C. M., Kuipers, L., & Power, M. (1992). Social networks and support in long-term psychiatric patients. *Psychological Medicine, 22*(04), 1019-1026.

Dahlan, R., Midin, M., Shah, S. A., Jaafar, N. R. N., Rahman, F. N. A., Baharudin, A., . . . Sidi, H. (2014). Functional remission and employment among patients with schizophrenia in Malaysia. *Comprehensive Psychiatry, 55*, S46-S51. doi: 10.1016/j.comppsych.2013.03.007

Davis, L., & Brekke, J. (2014). Social support and functional outcome in severe mental illness: The mediating role of proactive coping. *Psychiatry Research, 215*(1), 39-45. doi: 10.1016/j.psychres.2013.09.010

De Silva, M. J., McKenzie, K., Harpham, T., & Huttly, S. R. (2005). Social capital and mental illness: a systematic review. [Review]. *J Epidemiol Community Health, 59*(8), 619-627. doi: 10.1136/jech.2004.029678

Erickson, D., Beiser, M., & Iacono, W. (1998). Social support predict 5-year outcome in 1st-episode schizophrenia. *Journal of Abnormal Psychology, 107*(4), 681.

Erickson, D., Beiser, M., Iacono, W., Fleming, J., & Lin, T. (1989a). The role of social relationships in the course of first-episode schizophrenia and affective psychosis. *The American Journal of Psychiatry, 146*(11), 1456-1461.

Erickson, D. H., Beiser, M., Iacono, W. G., Fleming, J. A., & Lin, T. Y. (1989b). The role of social relationships in the course of first-episode schizophrenia and affective psychosis. [Research Support, Non-U.S. Gov't]. *American Journal of Psychiatry, 146*(11), 1456-1461.

Evert, H., Harvey, C., Trauer, T., & Herrman, H. (2003). The relationship between social networks and occupational and self-care functioning in people with psychosis. *Social Psychiatry and Psychiatric Epidemiology, 38*(4), 180-188.

Faccincani, C., Mignolli, G., & Platt, S. (1990). Service utilisation, social support and psychiatric status in a cohort of patients with schizophrenic psychoses: a 7 year follow-up study. *Schizophrenia Research, 3*(2), 139-146.

Fioravanti, M., Carlone, O., Vitale, B., Cinti, M. E., & Clare, L. (2005). A Meta-Analysis of Cognitive Deficits in Adults with a Diagnosis of Schizophrenia. [journal article]. *Neuropsychology Review, 15*(2), 73-95. doi: 10.1007/s11065-005-6254-9

Freeman, D. (2007). Suspicious minds: the psychology of persecutory delusions. [Research Support, Non-U.S. Gov't

Review]. *Clin Psychol Rev, 27*(4), 425-457. doi: 10.1016/j.cpr.2006.10.004

Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., & Bebbington, P. E. (2002). A cognitive model of persecutory delusions. *British Journal of Clinical Psychology, 41*(4), 331-347.

Gaebel, W., & Pletzcker, A. (1987). Prospective study of course of illness in schizophrenia: Part II. Prediction of outcome. *Schizophrenia Bulletin, 13*(2), 299.

Garety, P., Kuipers, E., Fowler, D., Freeman, D., & Bebbington, P. (2001). A cognitive model of the positive symptoms of psychosis. *Psychol Med, 31*(02), 189-195.

Gayer-Anderson, C., & Morgan, C. (2013). Social networks, support and early psychosis: a systematic review. *Epidemiology and psychiatric sciences, 22*(02), 131-146.

Gottlieb, B. H. (1983). Social support as a focus for integrative research in psychology. *American psychologist, 38*(3), 278.

Gumley, A., Taylor, H., Schwannauer, M., & MacBeth, A. (2014). A systematic review of attachment and psychosis: measurement, construct validity and outcomes. *Acta Psychiatrica Scandinavica, 129*(4), 257-274.

Haber, M. G., Cohen, J. L., Lucas, T., & Baltes, B. B. (2007). The relationship between self-reported received and perceived social support: A meta-analytic review. *American journal of community psychology, 39*(1-2), 133-144.

Häfner, H., Nowotny, B., Löffler, W., an der Heiden, W., & Maurer, K. (1995). When and how does schizophrenia produce social deficits? *European Archives of Psychiatry and Clinical Neuroscience, 246*(1), 17-28.

Hardy, A., Emsley, R., Freeman, D., Bebbington, P., Garety, E., Kuipers, E., Dunn, G., & Fowler, D. (2016). Psychological Mechanisms Mediating Effects Between Trauma and Psychotic Symptoms: The Role of Affect Regulation, Intrusive Trauma Memory, Beliefs, and Depression. *Schizophr Bull, In Press*.

Harrison, G., Hopper, K., Craig, T., Laska, E., Siegel, C., Wanderling, J., . . . DER HEIDEN, W. A. (2001). Recovery from psychotic illness: a 15-and 25-year international follow-up study. *The British Journal of Psychiatry, 178*(6), 506-517.

Higgins, J. P., & Green, S. (2008). *Cochrane handbook for systematic reviews of interventions* (Vol. 5): Wiley Online Library.

Hodges, A., Byrne, M., Grant, E., & Johnstone, E. (1999). People at risk of schizophrenia. Sample characteristics of the first 100 cases in the Edinburgh High-Risk Study. *The British Journal of Psychiatry, 174*(6), 547-553.

Horan, W. P., Subotnik, K. L., Snyder, K. S., & Nuechterlein, K. H. (2006). Do recent-onset schizophrenia patients experience a "social network crisis"? *Psychiatry, 69*(2), 115-129.

House, J. S. (1981). *Work stress and social support*. Reading, WA: Addison-Wesley.

House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *Annual review of sociology*, 293-318.

Howard, L., Leese, M., & Thornicroft, G. (2000). Social networks and functional status in patients with psychosis. *Acta Psychiatrica Scandinavica, 102*(5), 376-385.

Hultman, C. M., Ohman, A., Ohlund, L. S., Wieselgren, I.-M., & Ost, L.-G. (1996). Electrodermal activity and social network as predictors of outcome of episodes in schizophrenia. *Journal of Abnormal Psychology, 105*(4), 626-636.

Hultman, C. M., Wieselgren, I. M., & Ohman, A. (1997). Relationships between social support, social coping and life events in the relapse of schizophrenic patients. *Scandinavian Journal of Psychology, 38*(1), 3-13. doi: 10.1111/1467-9450.00002

Jeppesen, P., Petersen, L., Thorup, A., Abel, M.-B., Øhlenschlaeger, J., Christensen, T., . . . Nordentoft, M. (2008). The association between pre-morbid adjustment, duration of untreated psychosis and outcome in first-episode psychosis. *Psychological Medicine, 38*(08), 1157-1166.

Jorgensen, P., & Aagaard, J. (1988). A multivariate predictor analysis of course and outcome in delusional psychosis. [Research Support, Non-U.S. Gov't]. *Acta Psychiatrica Scandinavica, 77*(5), 543-550.

Jørgensen, P., & Aagaard, J. (1988). A multivariate predictor analysis of course and outcome in delusional psychosis. *Acta Psychiatrica Scandinavica, 77*(5), 543-550.

Kalla, O., Aaltonen, J., Wahl-ström, J., Lehtinen, V., Cabeza, I. G., Chávez, D., & González, M. (2002). Duration of untreated psychosis and its correlates in first-episode psychosis in Finland and Spain. *Acta Psychiatrica Scandinavica, 106*(4), 265-275.

Kalla, O., Wahlstyom, J., Aaltonen, J., Lehtinen, V., & Gonzalez de Chavez, M. (2011). 12-month follow-up of first-episode psychosis in Finland and Spain-Differential significance of social adjustment-related variables. *Clinical Psychologist, 15*(1), 22-32.

Kawachi, I., & Berkman, L. F. (2001). Social ties and mental health. *Journal of Urban health, 78*(3), 458-467.
Kay, S. R., Flszbein, A., & Opfer, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin, 13*(2), 261.
Kessler, R. C., & McLeod, J. D. (1985). *Social support and mental health in community samples*: Academic Press.
Kmet, L. M., Lee, R. C., & Cook, L. S. (2004). Standard quality assessment criteria for evaluating primary research papers from a variety of fields: Alberta Heritage Foundation for Medical Research Edmonton.
Kurtz, M. M., & Mueser, K. T. (2008). A meta-analysis of controlled research on social skills training for schizophrenia. *Journal of Consulting and Clinical Psychology, 76*(3), 491.
Lam, D. H. (1991). Psychosocial family intervention in schizophrenia: a review of empirical studies. *Psychological Medicine, 21*(02), 423-441.
Leavy, R. L. (1983). Social support and psychological disorder: A review. *Journal of community psychology*.
Leff, J. (2008). Climate change in psychiatry: periodic fluctuations or terminal trend? *Society and psychosis*, 11.
Liberman, R. P., & Kopelowicz, A. (2005). Recovery from schizophrenia: a concept in search of research. *Psychiatric Services*.
Lin, N., Cook, K. S., & Burt, R. S. (2001). *Social capital: Theory and research*: Transaction Publishers.
Lipton, Cohen, Fischer, & Katz. (1981). Schizophrenia: a network crisis. *Schizophrenia Bulletin, 7*(1), 144-151.
Longden, E., & Read, J. (2016). Social Adversity in the Etiology of Psychosis: A Review of the Evidence. *American Journal of Psychotherapy, 70*(1), 5-33.
Lukoff, D., Nuechterlein, K. H., & Ventura, J. (1986). Manual for the expanded brief psychiatric rating scale. Schizophr Bull, 12, 594-602.
MacBeth, A., & Gumley, A. (2008). Premorbid adjustment, symptom development and quality of life in first episode psychosis: a systematic review and critical reappraisal. *Acta Psychiatrica Scandinavica, 117*(2), 85-99.
Macdonald, E., Hayes, R., & Baglioni, A. (2000). The quantity and quality of the social networks of young people with early psychosis compared with closely matched controls. *Schizophrenia Research, 46*(1), 25-30.
March, D., Hatch, S. L., Morgan, C., Kirkbride, J. B., Bresnahan, M., Fearon, P., & Susser, E. (2008). Psychosis and place. *Epidemiologic Reviews, 30*(1), 84-100.
Marshall, M., Lewis, S., Lockwood, A., Drake, R., Jones, P., & Croudace, T. (2005). Association between duration of untreated psychosis and outcome in cohorts of first-episode patients: a systematic review. *Archives of General Psychiatry, 62*(9), 975-983.
Menezes, N., Arenovich, T., & Zipursky, R. (2006). A systematic review of longitudinal outcome studies of first-episode psychosis. *Psychological Medicine, 36*(10), 1349-1362.
Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine, 151*(4), 264-269.
Morgan, C., & Fisher, H. (2007). Environment and schizophrenia: environmental factors in schizophrenia: childhood trauma—a critical review. *Schizophrenia Bulletin, 33*(1), 3-10.
Morgan, C., McKenzie, K., & Fearon, P. (2008). *Society and psychosis*: Cambridge University Press.

Moritz, S., Andreou, C., Schneider, B. C., Wittekind, C. E., Menon, M., Balzan, R. P., & Woodward, T. S. (2014). Sowing the seeds of doubt: a narrative review on metacognitive training in schizophrenia. *Clinical Psychology Review, 34*(4), 358-366.

Mortimer, A. M., McKenna, P., Lund, C., & Mannuzza, S. (1989). Rating of negative symptoms using the High Royds Evaluation of Negativity (HEN) scale. *The British Journal of Psychiatry*.

Neeleman, J., & Power, M. (1994). Social support and depression in three groups of psychiatric patients and a group of medical controls. *Social Psychiatry and Psychiatric Epidemiology, 29*(1), 46-51.

Newlin, M., Webber, M., Morris, D., & Howarth, S. (2015). Social participation interventions for adults with mental health problems: A review and narrative synthesis. *Social Work Research, 39*(3), 167-180.

NICE. (2014). National Institute for Health and Care Excellence. Psychosis and schizophrenia in adults: prevention and management. NICE guideline (CG183).

Norman, R. M., & Malla, A. K. (2001). Duration of untreated psychosis: a critical examination of the concept and its importance. *Psychological Medicine, 31*(03), 381-400.

Norman, R. M., Malla, A. K., Manchanda, R., Harricharan, R., Takhar, J., & Northcott, S. (2005). Social support and three-year symptom and admission outcomes for first episode psychosis. *Schizophr Res, 80*(2), 227-234.

Ochoa, S., Usall, J., Cobo, J., Labad, X., & Kulkarni, J. (2012). Gender differences in schizophrenia and first-episode psychosis: a comprehensive literature review. *Schizophrenia research and treatment, 2012*.

Palumbo, C., Volpe, U., Matanov, A., Priebe, S., & Giacco, D. (2015). Social networks of patients with psychosis: a systematic review. *BMC research notes, 8*(1), 560.

Pearlin, L. I. (1985). Social structure and processes of social support.

Penttilä, M., Jääskeläinen, E., Hirvonen, N., Isohanni, M., & Miettunen, J. (2014). Duration of untreated psychosis as predictor of long-term outcome in schizophrenia: systematic review and meta-analysis. *The British Journal of Psychiatry, 205*(2), 88-94.

Peralta, V., Cuesta, M. J., Martinez-Larrea, A., Serrano, J. F., & Langarica, M. (2005). Duration of untreated psychotic illness: The role of premorbid social support networks. *Social Psychiatry and Psychiatric Epidemiology, 40*(5), 345-349.

Perkins, D. O., Gu, H., Boteva, K., & Lieberman, J. A. (2005). Relationship between duration of untreated psychosis and outcome in first-episode schizophrenia: a critical review and meta-analysis. *American journal of Psychiatry, 162*(10), 1785-1804.

Pilling, S., Bebbington, P., Kuipers, E., Garety, P., Geddes, J., Martindale, B., . . . Morgan, C. (2002). Psychological treatments in schizophrenia: II. Meta-analyses of randomized controlled trials of social skills training and cognitive remediation. *Psychological Medicine, 32*(05), 783-791.

Pilling, S., Bebbington, P., Kuipers, E., Garety, P., Geddes, J., Orbach, G., & Morgan, C. (2002). Psychological treatments in schizophrenia: I. Meta-analysis of family intervention and cognitive behaviour therapy. *Psychological medicine, 32*(05), 763-782.

Power, M., Champion, L., & Aris, S. (1988). The development of a measure of social support: the Significant Others (SOS) Scale. *British Journal of Clinical Psychology, 27*(4), 349-358.

Prudo, R., & Blum, H. M. (1987). Five-year outcome and prognosis in schizophrenia: a report from the London Field Research Centre of the International Pilot Study of Schizophrenia. *The British journal of psychiatry, 150*(3), 345-354.

Pruessner, M., Iyer, S. N., Faridi, K., Joober, R., & Malla, A. K. (2011). Stress and protective factors in individuals at ultra-high risk for psychosis, first episode psychosis and healthy controls. *Schizophr Res, 129*(1), 29-35.

Read, & Gumley, A. (2008). Can attachment theory help explain the relationship between childhood adversity and psychosis? *Attachment: New Directions in Psychotherapy and Relational Psychoanalysis, 2*(1), 1-35.

Read, J., van Os, J., Morrison, A. P., & Ross, C. A. (2005). Childhood trauma, psychosis and schizophrenia: a literature review with theoretical and clinical implications. [Review]. *Acta Psychiatr Scand, 112*(5), 330-350. doi: 10.1111/j.1600-0447.2005.00634.x

Reininghaus, U. A., Morgan, C., Simpson, J., Dazzan, P., Morgan, K., Doody, G. A., . . . Murray, R. (2008). Unemployment, social isolation, achievement–expectation mismatch and psychosis: findings from the ÆSOP Study. *Social Psychiatry and Psychiatric Epidemiology, 43*(9), 743-751.

Reuters, T. (2011). Endnote X5. *Thomson Reuters, New York*.

Rosenthal, R., Cooper, H., & Hedges, L. (1994). Parametric measures of effect size. *The handbook of research synthesis*, 231-244.

Salokangas, R. K. (1997). Living situation, social network and outcome in schizophrenia: a five-year prospective follow-up study. [Research Support, Non-U.S. Gov't]. *Acta Psychiatrica Scandinavica, 96*(6), 459-468.

Schofield, P., Ashworth, M., & Jones, R. (2011). Ethnic isolation and psychosis: re-examining the ethnic density effect. *Psychol Med, 41*(06), 1263-1269.

Shapiro, D. L., & Levendosky, A. A. (1999). Adolescent survivors of childhood sexual abuse: The mediating role of attachment style and coping in psychological and interpersonal functioning. *Child Abuse & Neglect, 23*(11), 1175-1191.

Song, Y. Y., Kim, K. R., Park, J. Y., Lee, S. Y., Kang, J. I., Lee, E., . . . Kwon, J. S. (2011). Associated factors of quality of life in first-episode schizophrenia patients. *Psychiatry investigation, 8*(3), 201-206.

Sündermann, O., Onwumere, J., Kane, F., Morgan, C., & Kuipers, E. (2014). Social networks and support in first-episode psychosis: exploring the role of loneliness and anxiety. *Social psychiatry and psychiatric epidemiology, 49*(3), 359-366.

Susser, E., Schwartz, S., Morabia, A., & Bromet, E. J. (2006). *Psychiatric epidemiology: searching for the causes of mental disorders*: Oxford University Press.

Tempier, R., Balbuena, L., Garety, P., & Craig, T. J. (2012). Does Assertive Community Outreach Improve Social Support? Results From the Lambeth Study of Early-Episode Psychosis. *Psychiatric Services, 63*(3), 216-222. doi: 10.1176/appi.ps.20110013

Tempier, R., Balbuena, L., Lepnurm, M., & Craig, T. K. (2013). Perceived emotional support in remission: results from an 18-month follow-up of patients with early episode psychosis. *Social Psychiatry and Psychiatric Epidemiology, 48*(12), 1897-1904.

Tew, J., Ramon, S., Slade, M., Bird, V., Melton, J., & Le Boutillier, C. (2011). Social factors and recovery from mental health difficulties: a review of the evidence. *British journal of social work*, bcr076.

Thorup, A., Petersen, L., Jeppesen, P., Øhlenschlæger, J., Christensen, T., Krarup, G., . . . Nordentoft, M. (2006). Social network among young adults with first-episode schizophrenia spectrum disorders. *Social Psychiatry and Psychiatric Epidemiology, 41*(10), 761-770.

Turner, R. J., & Brown, R. L. (2010). Social support and mental health.

Uchino, B. N., Cacioppo, J. T., & Kiecolt-Glaser, J. K. (1996). The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. *Psychological bulletin, 119*(3), 488.

Varese, F., Smeets, F., Drukker, M., Lieverse, R., Lataster, T., Viechtbauer, W., . . . Bentall, R. P. (2012). Childhood adversities increase the risk of psychosis: a meta-analysis of patient-control, prospective- and cross-sectional cohort studies. [Meta-Analysis
Research Support, Non-U.S. Gov't
Review]. *Schizophr Bull, 38*(4), 661-671. doi: 10.1093/schbul/sbs050

Vassos, E., Pedersen, C. B., Murray, R. M., Collier, D. A., & Lewis, C. M. (2012). Meta-analysis of the association of urbanicity with schizophrenia. *Schizophrenia Bulletin, 38*(6), 1118-1123.

Veling, W., Susser, E., Jim van Os, M., Mackenbach, J. P., Selten, J.-P., & Hoek, H. W. (2008). Ethnic density of neighborhoods and incidence of psychotic disorders among immigrants. *American journal of Psychiatry*.

Viinamaki, H., Niskanen, L., Jaaskelainen, J., Antikainen, R., KoivumaaHonkanen, H., Tanskanen, A., . . . Lehtonen, J. (1996). Factors predicting psychosocial recovery in psychiatric patients. *Acta Psychiatrica Scandinavica, 94*(5), 365-371. doi: 10.1111/j.1600-0447.1996.tb09874.x

Wagman, A. (1988). Deficit and nondeficit forms of schizophrenia: the concept. *Am J Psychiatry, 145*, 578-583.

Whitehorn, D., Brown, J., Richard, J., Rui, Q., & Kopala, L. (2002). Multiple dimensions of recovery in early psychosis. *International Review of Psychiatry, 14*(4), 273-283.

Part 2: Empirical Paper

No Man is an Island: Exploring the Links between Social Connectedness and Trust in Clinical Paranoia, using a Virtual Reality Paradigm

Abstract

Aims: The impact of social connectedness (levels of current social isolation and social support) on the development and maintenance of paranoia is poorly understood. This study aimed to use interactive virtual reality technology to investigate the links between social connectedness and the ability to trust another individual in people experiencing paranoia and psychosis. It also aimed to investigate whether attachment style was implicated with ability to trust within this population.

Methods: Eighteen young men with current clinical paranoia and psychosis completed questionnaires examining current social connectedness, attachment style and clinical symptom levels before entering a pleasant virtual reality scenario and engaging in a social interaction with a friendly virtual reality flatmate (avatar). A subjective measure of trust towards the avatar and objective trusting behaviour (the minimum distance that an individual maintained from the avatar) were recorded.

Results: Significant negative associations were found between several measures of social connectedness pertaining to social resource and objective trust of the avatar. Insecure attachment style was also associated with lower objective trust of the avatar. Similar associations were not found between social connectedness or attachment variables and subjective trust of the avatar.

Conclusions: This study was the first to utilise a virtual reality social interaction with a sample experiencing clinical paranoia. The findings provide initial support that within this population, current levels of social connectedness are implicated with behavioural markers of trust of an unknown individual. Differing processes underlying the links between social connectedness and trust are discussed in the context both of the complex mechanisms of paranoia, and within the methodological constraints of the current study. Implications for future research and intervention utilising virtual reality technology are considered.

1. Introduction

1.1 Paranoia and persecutory delusions

Paranoid thinking is experienced by many individuals at some level, with conservative estimates suggesting that paranoid thoughts occur in approximately 15% of the population (Freeman, Garety, Bebbington, Smith, et al., 2005). In a non-clinical population, 20% believed that at some point in the past year people were against them, and 10% felt that people had deliberately acted to harm them (Johns & van Os, 2001). Paranoid ideation can be seen as on a continuum of psychosis, with recent research suggesting that similar mechanisms may underlie both individuals reporting non-clinical levels of paranoia and individuals with severe mental health difficulties (Claridge, 1997; Johns, 2005; Johns & van Os, 2001; Peters, Joseph, & Garety, 1999; Strauss, 1969; van Os & Verdoux, 2003; Verdoux & van Os, 2002). At the more severe end of this hypothesised psychosis spectrum lie persecutory delusions: a specific type of delusion whereby a sufferer believes that harm is occurring, or going to occur in the future, and crucially, that the harm is intentional (Freeman & Garety, 2000).

Persecutory delusions were found to be the second most common symptom of psychosis after ideas of reference (Sartorius et al., 1986), occurring in almost 50% of cases presenting for treatment. This is a category of delusional belief that causes marked distress to the sufferer (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002), and is the most likely to be acted upon (Wessely et al., 1993).

1.2 Social factors in paranoia and persecutory delusions

In Freeman et al's (2002) model of the formation of persecutory delusions, it is proposed that once an anomalous experience has occurred due to interactions between a

precipitant (such as a stressful life event or substance misuse) with cognitive biases and emotional factors, an individual searches for meaning. The way in which this search progresses can be influenced by three factors in the model: beliefs about illness, belief flexibility, and finally social factors. For example, an individual who is socially isolated may be either unable or unwilling to discuss their experiences with others, therefore missing out on the disconfirmation or comfort that would help reduce belief conviction (Freeman, 2007; Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001; Morrison, 2001).

In a maintenance model (Freeman et al., 2002), the persecutory delusion is argued to influence an individual's social behaviour in several ways, whilst their current social environment may also serve to reinforce the delusion. Socially isolating oneself, or becoming aggressive as the result of a persecutory delusion, can be conceptualised as a safety behaviour (Freeman et al., 2007) as the intention is to reduce the perceived threat of harm. Factors contributing to social isolation, conceptualised as reduced social engagement, low social support and low levels of social capital could also play an important role in the development and maintenance of paranoia, and in the way that an individual therefore perceives and interacts with others (Freeman et al., 2002). Behind these inter-related factors lie different pathways to isolation and to heightened levels of paranoia (Berkman & Glass, 2000; Cohen, 2004).

1.2.1 Social engagement and integration

Social engagement and integration, defined as the participation in a broad range of relationships as well as having a social role and purpose (Brissette, Cohen, & Seeman, 2000), promotes positive psychological states and increases a sense of identification, belonging and positive affect, as well as increasing motivation towards self-care (Cohen, 2004). The main effect model (Cohen, 2004) suggests that social engagement provides guidance that influences an individual's behaviour (Berkman et al., 2000) and helps them to act in

accordance with social norms, for example the motivation to care for oneself and for others. Emotional regulation is also thought to be influenced by interacting with others, increasing positive affect and limiting the duration and intensity of negative affect (Cohen, 1988).

Individuals with high non-clinical levels of paranoia report more problems in social engagement, fewer social contacts, and more problems in social perception and social skills (Combs, Finn, Wohlfahrt, Penn, & Basso, 2013). Clinical populations both with first episode and long-standing psychosis have been found to have diminished social networks (Beels, 1981; Gayer-Anderson & Morgan, 2013). Interestingly, this group's performance on tests of knowledge of social situations is significantly poorer than both non-clinical controls and individuals with a diagnosis of bipolar disorder, a finding that has been explained by their reduced social engagement (Cutting & Murphy, 1990) and difficulties with social cognition (Couture, Penn, & Roberts, 2006).

1.2.2 Social capital

Social capital differs from social engagement in that it is defined as the quantity and quality of networks amongst people, and the shared values and identity that arise from these networks (Bourdieu, 2006). There are several definitions of social capital, however the one used within this proposal refers to structural social capital, similar to the concept of instrumental social support (House, Umberson, & Landis, 1988) with tangible aid offered, and to concepts highlighting access to resources and goods (Berkman et al., 2000). Access to social capital can relieve stressful situations, especially when an individual is in a vulnerable position, for example when they experience housing and financial difficulties in the context of emerging mental health difficulties. Evidence specifically examining links in mental illness reports lower levels of social capital in cases than in controls (Song et al., 2011; Webber, Huxley, & Harris, 2011). Individuals with psychosis have been found to possess less active social capital than controls, but similar levels of passive social capital, suggesting that

although they are in receipt of services and opportunities, they struggle to actively engage and remained isolated (De Silva, McKenzie, Harpham, & Huttly, 2005; Schneider, Arthur, Doody, Simpson, & Jones, 2009).

1.2.3 Perceived social support

Social support provides a stress buffer, whereby an individual's perceptions of emotional and material support available to them protects against psychological distress (Cohen, 2004). In longstanding psychosis, individuals perceive their level of social support as lower than a non-clinical population (Gayer-Anderson & Morgan, 2013). Findings are more mixed for individuals experiencing a first episode of psychosis (Macdonald, Hayes, & Baglioni Jr, 2000; Pruessner, Iyer, Faridi, Joober, & Malla, 2011; Song et al., 2011), suggesting that at this stage a perception of social isolation and lack of support may not be so entrenched. However, social support is of importance in early psychosis, given associations with better outcomes and lower symptomatology (Norman et al., 2005). Sündermann, Onwumere, Kane, Morgan, and Kuipers (2014) found that depressive symptoms and psychosis were strongly associated with poor perceived social support, as well as subjective loneliness and the absence of a confidant.

Loneliness, defined as a distressing subjective state arising from a disparity between the desired and the current state of social contact (Sündermann et al., 2014), is associated with reduced life satisfaction and mental health problems (Neeleman & Power, 1994). Individuals with psychosis experience an increase in loneliness over their lifetime alongside a decrease in positive interactions with other people. Regardless of social network size, individuals with psychosis experience higher subjective loneliness levels than controls and other psychiatric patients (Neeleman & Power, 1994).

In sum, reduced social support might prevent the individual from opportunities to manage stress (Cohen, 2004), diminished social capital might mean less access to problem

solving resources (De Silva et al., 2005; Webber, et al., 2011) and a lack of social engagement may prevent an individual from the experience of having a valued role and the positive affect associated with affiliative activities (Cohen, 2004). Additionally, all factors provide access to social norms, allowing the individual to navigate everyday encounters successfully.

1.3 Early interpersonal factors in paranoia

It is not simply the current level of social support that should be considered when discussing the development and maintenance of paranoia. Research examining the role of interpersonal factors suggests that an insecure attachment style is linked with psychosis (Berry, Barrowclough, & Wearden, 2008). The attachment between infant and primary caregiver is influenced by early childhood adversity (Varese et al., 2012) and forms the template for later relationships (Bowlby, 1969). Early physical or sexual abuse (Read & Gumley, 2008; Read, van Os, Morrison, & Ross, 2005) and parental loss or separation (Agid et al., 1999) may all be related to the presence of psychotic symptoms including delusions in later life. Avoidant attachment, characterised by avoidance of close relationships, interpersonal hostility and social withdrawal (Bartholomew & Horowitz, 1991) is linked to an increased rate of psychotic symptoms (Berry et al., 2008; Dozier, Stevenson, Lee, & Velligan, 1991). Interestingly, an insecure attachment style has also been argued to mediate the relationship between depression and reduced social capital (Webber et al., 2011). Insecure attachment has shown specific links to paranoia, whereas similar strength links have not consistently been reported to other positive symptoms of psychosis such as hallucinations (Bentall & Fernyhough, 2008; Meins, Jones, Fernyhough, Hurndall, & Koronis, 2008; Pickering, Simpson, & Bentall, 2008).

Impairments in Theory of Mind (ToM), the ability to represent one's own and another's mental state and infer the intentions of another are reported in individuals with psychosis (Simon Baron-Cohen, Leslie, & Frith, 1985; Bora, Yucel, & Pantelis, 2009; Brüne,

2005; Corcoran, 2000). Insecurely attached individuals hold a negative model of the self; thus when this is combined with impairments in ToM it is hypothesised to result in difficulty attributing stressful scenarios to benign situational factors, and a proneness to the development of paranoid beliefs about themselves or others (Bentall & Fernyhough, 2008). ToM difficulties are associated with poor outcomes and paranoia symptom severity (Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001; Randall, Corcoran, Day, & Bentall, 2003).

1.4 Virtual reality

1.4.1 Virtual reality research paradigms

In recent years, the development of virtual reality has offered the opportunity to conduct experimentally controlled research using a naturalistic environment. Virtual reality paradigms allow objectively neutral avatars to be created, therefore isolating and identifying unfounded appraisals (Fornells-Ambrojo et al., 2008; Freeman, Garety, Bebbington, Slater, et al., 2005; Freeman et al., 2003; Valmaggia et al., 2007).

1.4.2 Virtual reality and paranoia

Virtual reality research in paranoia allows the experimental manipulation of non-verbal responses in a manner that would not be possible using an actor. This allows an individual's safety behaviours to be controlled for, and therefore directly evaluates participants' perception of the social environment (Fornells-Ambrojo et al., 2008). Neutral or ambiguous virtual reality scenarios have been found to elicit paranoia in individuals with high-trait non-clinical paranoia, an at-risk mental state, early psychosis, and persecutory delusions (Fornells-Ambrojo et al., 2008; Freeman, Garety, Bebbington, Slater, et al., 2005; Freeman, Pugh, Vorontsova, Antley, & Slater, 2010; Valmaggia et al., 2007).

Paranoid thoughts experienced in virtual reality paradigms are predicted by a higher trait paranoia, as well as affective factors including worry and anxiety levels (Freeman, Garety, Bebbington, Slater, et al., 2005; Freeman et al., 2008; Freeman et al., 2010; Valmaggia et al., 2007). Cognitive inflexibility, perseveration and interpersonal sensitivity also predicted paranoid thoughts (Freeman et al., 2003; Valmaggia et al., 2007), as well as the participants' reported immersion in the virtual reality environment (Freeman et al., 2003; Valmaggia et al., 2007) and levels of self-confidence (Atherton et al., 2014).

Virtual reality further allows proxemics – the interpersonal space that an individual maintains between themselves and another – to be empirically examined (Bailenson, Blascovich, Beall, & Loomis, 2003; Hall et al., 1968). Individuals with psychosis typically maintain larger interpersonal distances from others than non-clinical individuals, thought to be due to negative symptoms such as social withdrawal, the level of paranoid threat, and a higher tendency towards attributing situations to other external factors out of personal control (Duke & Mullens, 1973; Nechamkin, Salganik, Modai, & Ponizovsky, 2003; Schoretsanitis, Kutynia, Stegmayer, Strik, & Walther, 2016).

Whereas previous research has given participants solely a non-verbal role in the virtual reality environment, a recent virtual reality paradigm (Fornells-Ambrojo et al., 2016) has for the first time enabled direct verbal interaction with a virtual reality character (an avatar). Furthermore, the scenario was designed to be a pleasant peer interaction, rather than the neutral or ambiguous experience created in previous studies. This study found that the ability to trust the avatar, conceptualised by a smaller interpersonal distance maintained by the participant from the avatar (Bailenson et al., 2003), was predicted by levels of paranoia. Regardless of whether the avatar responded in a highly contingent or less contingent manner to the participant's interpersonal body-language, an insecure dismissive attachment style was predictive of increased levels of subjective trust of the avatar, but reduced objective trusting behaviour (interpersonal distance kept).

1.4.3 Virtual reality, social factors and paranoia

As discussed, paranoia may result in safety behaviours including social withdrawal and aggression, therefore higher levels of the trait may impact on social relationships and increase social isolation (Freeman, 2007; Freeman et al., 2002). A current aversive social environment can increase the likelihood of paranoia (Allardyce & Boydell, 2006; Wilson et al., 2016). Low social engagement, levels of perceived social support, and social capital are linked to an increased risk of psychosis and paranoia (Cohen, 2004; Gayer-Anderson & Morgan, 2013; Song et al., 2011). The isolation associated with these factors may limit the likelihood that alternative explanations are developed for anomalous experiences and delusional beliefs (Sündermann et al., 2014), which also help to reduce paranoid appraisals (Freeman et al., 2002).

Limited emphasis to date, however, has been placed on the role of social factors in paranoia within virtual reality paradigms (Brinkman et al., 2012; Valmaggia et al., 2015; Veling, Brinkman, Dorrestijn, & Van Der Gaag, 2014). The level of social defeat, theorised to be the result of prolonged exposure to social exclusion and adversity, (Selten, van der Ven, Rutten, & Cantor-Graae, 2013) is a significant predictor of paranoid appraisals in a virtual reality scenario (Valmaggia et al., 2015). Negative social comparison, as operationalised by reduced height, was predictive of increased levels of paranoia and mistrust (Freeman et al., 2014). Social isolation and withdrawal may also be understood as a safety behaviour within paranoia, leading to paranoid beliefs about others being perpetuated (Freeman et al., 2007); accordingly reducing safety behaviours using virtual reality has a beneficial impact on symptoms (Freeman et al., 2016). Unpublished findings (Fornells-Ambrojo, 2007) showed that in a virtual reality Underground train setting, higher levels of persecutory ideation towards virtual passengers were associated with everyday behaviour in the form of passive social withdrawal. Links between current social connectedness and paranoia have not yet been studied using a virtual reality paradigm.

1.5 Study aims

This study used a virtual reality paradigm where participants interacted with a virtual flatmate (an 'avatar') in a pleasant scenario. This is the first known study to utilise a verbal interactive virtual reality paradigm with participants with clinical paranoia.

The main aim of the present study was to understand the impact that social isolation and social support (or 'social connectedness') have on the ability to trust another individual and display trusting behaviour in people with psychosis experiencing paranoia. The study also aimed to investigate whether attachment style was implicated with ability to trust and display trusting behaviour within this clinical population.

1.6 Hypotheses

The specific hypotheses for the study were therefore as follows. In males with early psychosis experiencing current paranoia:

Hypothesis 1: A higher level of social connectedness in everyday life will be associated with increased subjective trust towards the avatar.

Hypothesis 2: A higher level of social connectedness in everyday life will be associated with trusting behaviour operationalised as moving closer to the avatar.

Hypothesis 3: Insecure attachment will be associated with reduced subjective trust and trusting behaviour towards the avatar.

2. Method

This study was a joint project completed with a Clinical Psychology Doctoral Trainee, GW (see Appendix 2). Core measures of subjective trust and objective trust behaviour in the virtual reality paradigm were utilised by both researchers. Attention and sense of

presence checks during the virtual reality paradigm were also utilised by both researchers. No other measures were shared between researchers.

2.1 Study Design

This study employed a group comparison design, with participants randomised using a random block design to one of two conditions for a virtual reality scenario (high avatar contingency versus low avatar contingency). The effect of contingency manipulation on trust of the avatar was analysed by the joint researcher (GW). For the purposes of this analysis, the contingency conditions are treated as one group.

2.2 Participants

Participants were recruited from Early Intervention for Psychosis Teams from four London boroughs.

Inclusion criteria were: male[1]; a diagnosis of psychosis, schizophrenia, or schizoaffective disorder; a current clinical level of paranoia[2]; and ability to travel (with or without support) into the centre of London in order to complete the study.

Exclusion criteria for the study were: a history of epilepsy[3]; a current clinical presentation which prevented engaging with the virtual reality exercise and completing primary measures; an inability to read or speak English; and individuals currently under a Section of the Mental Health Act.

[1] This is to control for gender differences in appraisal of the male virtual reality avatar (Felnhofer, Kothgassner, Beutl, Hlavacs, & Kryspin-Exner,2012).

[2] As reported by Care Coordinator and measured by score >33 on one section of Green's Paranoid Thought Scales (Green et al., 2008).

[3] Due to the risk from the virtual reality paradigm.

2.3 Sample size and power analysis

No study has used the same methodology to examine the impact of social isolation factors and interpersonal factors on trust in a sample with clinical paranoia.

However, a recent study looking at links between social support and paranoia showed a medium effect size ($r = 0.35$) of the association between positive symptoms of psychosis and satisfaction with social support (Sündermann et al., 2014). A power analysis conducted using G*Power 3 (Faul, 2007) with the $r = 0.35$ effect size yielded a necessary sample size of 49 ($\alpha = 0.05$, $\beta = 0.8$). This study therefore had aimed to recruit sixty participants, to allow for thirty participants in each contingency condition, with flexibility for dropouts.

The present study did not achieve this sample size, recruiting a total of eighteen participants. A post hoc analysis using G*Power 3 was conducted utilising various magnitudes of effect size (Cohen, 1992) on a basis of testing a two-tailed hypothesis, where $n = 18$ and $\alpha = 0.05$. For substantial effect sizes ($r = 0.6$, $\alpha = 0.05$), $\beta = 0.85$. In order to successfully detect a substantial effect size, the required sample size was $n = 17$, which was surpassed by the current sample. For large effect sizes, ($r = 0.5$, $\alpha = 0.05$), $\beta = 0.63$. In order to successfully detect a large effect size, the required sample size was $n = 26$. For medium effect sizes ($r = 0.3$, $\alpha = 0.05$), $\beta = 0.24$. In order to successfully detect a medium effect size, the required sample size was $n = 82$. This meant that the study was under-powered to detect effect sizes lower than approximately $r = 0.6$.

2.4 Ethical approval

Ethical approval for this research was gained through the National Research Ethics Service, Camberwell St Giles Research Ethics Committee (REC reference 15/LO/1197). Please see Appendix 3 for documentation.

The virtual reality paradigm was designed to be a pleasant, non-intrusive experience for participants. Previous research using virtual reality with an at-risk for psychosis population has found that participants were not distressed by their time in the environment, nor subject to adverse experiences over the following week (Fornells-Ambrojo et al., 2008). A brief post research interview included a debrief component which allowed the researchers to check participants' affect resulting from the questionnaires and the virtual reality scenario. Good communication links with Care Coordinators were maintained throughout the research process to ensure that timely feedback was given surrounding participants' experiences.

Travelling into the virtual reality laboratory in Central London may have proven anxiety-provoking for some participants with clinical paranoia. The researchers ensured that potential participants were able to manage this at the initial screening, and accompanied participants to the laboratory from their local area where necessary.

2.5 Procedure

2.5.1 Participant recruitment and screening

The purposes of the study and inclusion criteria were explained to Care Coordinators within the four Early Intervention for Psychosis (EIPT) services. These professionals then approached potentially suitable clients from their caseload, gave them the Participant Information Sheet (see Appendix 4) and asked them for permission to be contacted by a member of the research team. On gaining permission, the researcher gave the potential participant more information about the study based on the Participant Information Sheet and, if they expressed an interest in the study, completed a screening questionnaire using the Green et al. Paranoid Thought Scales (GPTS) (Green et al., 2008). To meet inclusion criteria, participants were required to score 33 or above on either section A or B of this

questionnaire (see Appendix 5). Although no paranoia measure has a specified clinical cut off, this score is consistent with a current clinical trial using a psychosis population (Hardy, 2016) and with advice sought from Prof Daniel Freeman and Dr Amy Hardy.

Once recruited, arrangements were made with the participant to meet with them at their preferred location (near to their home, or near to the virtual reality laboratory) at a convenient time to travel to the laboratory and complete the study. The maximum interim between screening and participation in the study was one week, to minimise risk that an individual's level of paranoia would change and fall below threshold for participation in the study. In one instance where this was not possible, the participant was re-screened directly before participating in the study to confirm their current level of paranoia.

Care Coordinators and their teams identified 68 potential participants for the study. Of these, 41 were successfully contacted by Care Coordinators and 30 further agreed to be contacted by the researchers.

The following reasons for non-participation were given by potential participants, before screening, to the researchers: a reported lack of interest or a feeling that the study did not apply to them (n = 5), a reported inability to travel into Central London to complete the study due to health or other reasons (n = 3), a lack of availability during the opening hours of the virtual reality laboratory (n = 2), an inability to make contact with respondent after screening and recruitment (n = 1). One further participant was screened but did not meet criteria on the GPTS for current levels of paranoia. Eighteen participants successfully completed the study.

Demographic and clinical information was not gathered at this stage due to ethical approval restrictions. Symptom screening questionnaires were not given prior to verbal consent to the study. This means that information about the representativeness of the study sample when compared to others in the sample population is unknown.

2.5.2 Study protocol

After the initial screening, the research was completed in one session. Table 1 shows the three stages of the study.

Table 1: Stages of study

Pre Virtual Reality Scenario	Virtual Reality Scenario	Post Virtual Reality Scenario
1. Participant Randomised to High or Low Contingency	14. Brief Introduction to Scenario	19. Positive and Negative Affect Schedule – Post Virtual Reality* (PANAS)
2. Written Consent Gained	15. Opportunity to Practice Questions	20. Detection of Contingency
3. UCLA Loneliness (UCLA)	16. Participant interviews the Virtual flatmate (asks four questions)	21. Attention Checks
4. Significant Others Scale (SOS)	17. Flatmate invites participant to look at terrace	22. Sense of Presence Questionnaire (SOP)
5. Resource Generator UK (RG-UK)	18. Distance between avatar and participant recorded	23. Focus of Attention Questionnaire (FAQ)
6. Relationship Questionnaire (RQ)		24. Trust in Close Relationships – Revised (TICR)
7. First Episode Social Functioning Scale (FESFS)		25. Subjective Trust Question
8. Community Assessment of Psychic Experiences-42 (CAPE-42)		26. Qualitative Interview* and Debrief
9. Paranoia Scale (PS)		27. Payment of Expenses
10. Green Paranoid Thought Scale* (GPTS)		
11. PSYRATS- Delusions* (PSYRATS-D)		
12. Social Interaction Anxiety Scale* (SIAS)		
13. Positive and Negative Affect Schedule* (PANAS)		

Notes: *Measures used in joint researcher's (GW) thesis.
Validated questionnaires are as follows. UCLA Loneliness (Russell, 1996), Significant Others Scale (Power, Champion, & Aris, 1988), Resource Generator UK (Webber & Huxley, 2007), Reading the Eyes in the Mind Test Revised (S. Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001), Relationship Questionnaire (Bartholomew & Horowitz, 1991), First Episode Social Functioning Scale (Bourdeau, Lecomte, & Lysaker, 2015), Community Assessment of Psychic Experiences-42 (Konings, Bak, Hanssen, Van Os, & Krabbendam, 2006), Paranoia Scale (Fenigstein & Vanable, 1992), PSYRATS-D (Haddock, McCarron, Tarrier, & Faragher, 1999), Green Paranoid Thought Scales (Green et al., 2008), Social Interaction Anxiety Scale (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1993), Positive and Negative Anxiety Scale (Watson, Clark, & Tellegen, 1988), Sense of Presence Questionnaire (Slater, McCarthy, & Maringelli, 1998), Focus of Attention Questionnaire (Woody, 1996), Trust in Close Relationships- Revised, adapted from (Rempel, Holmes, & Zanna, 1985).

2.5.3 Pre virtual reality

On arrival at the virtual reality lab, written consent was obtained from participants (see Appendix 6). Participants then completed the pre virtual reality questionnaires, which examined social connectedness variables (UCLA, SOS, RG-UK, and FESFS), attachment style

(RQ), levels of current paranoia (PS), and psychosis symptomatology (CAPE-42) (see Appendices 7-13).

2.5.4 Virtual reality scenario

Before the participant was introduced to the virtual environment, a generic explanation was given about the purpose of the scenario. Participants were told that the study was interested in seeing how people interact with virtual environments, and in particular in understanding their impressions of a virtual reality avatar.

Participants were then told that they would enter a virtual student flat which was available for rent, and that they would meet a virtual flatmate. Participants were instructed to interview the virtual flatmate about the flat, and were provided with four questions to ask the flatmate, in order, on a prompt sheet (See Appendix 14). They were asked to read through and familiarise themselves with these questions, and took the prompt sheet with them into the scenario. Participants were informed that the virtual flatmate would start the interview by introducing himself and may ask their name. They were also told that the virtual flatmate would end the interview.

At this point, participants were introduced to the virtual reality scenario view which had been hidden from view by a curtain. They were given a pair of 3D glasses to wear and a check was made that the environment was appearing in 3D. Participants were allowed to look around the virtual flat to acclimatise to the environment. They were then instructed to stand on a pre-determined mark on the floor facing the virtual flatmate (approximately 200cm from the avatar) and were told they could act naturally and move as they wished during the scenario. Once the participant had positioned themselves on the mark, the virtual reality animation was started. The scenario lasted approximated two and a half minutes.

Immediately following completion of the study, a check was made that the participant was not feeling any ill-effects.

2.5.5 Post virtual reality

Participants were then asked to complete further questionnaire measures about their experience of the virtual reality environment and the virtual flatmate (attention and detection of contingency checks, SOP, TICR, subjective trust measure) (See Appendices 15-17). A short interview was then completed, examining the participant's perception of the avatar, asking more about their impressions of the virtual reality paradigm, and encompassing a debrief. The research lasted for ninety minutes on average. Participants were paid £12.50 for their time, and any travel expenses incurred were refunded.

2.5.6 Apparatus

The virtual flat was displayed in an immersive projection system within the virtual reality laboratory at University College London. High resolution images were projected in real-time onto three walls (measuring 3m x 2.2m) and the floor (measuring (3m x 3m) of a Computer Aided Virtual Environment (CAVE). The virtual world was presented in stereo using Lightweight CrystalEyes shutter glasses. These glasses, worn by the participant, presented separate images to the left and right eyes, producing an impression of 3D objects both within and beyond the walls of the CAVE. An inertial/ultrasonic head-tracking device was mounted on the glasses, which enabled images to be presented with reference to the participants' orientation and viewpoint. This equipment supported naturalistic sensorimotor contingencies for visual perception, meaning that as the participants moved around, the environment displayed perspective correct information. Spatially-oriented audio was delivered via four speakers, situated at each corner of the CAVE.

The virtual reality flatmate's responses were controlled using button presses on a wireless handheld device. This allowed the researcher to cue the virtual flatmate's responses quickly and easily in real-time, whilst watching the scenario. One button was used when a participant spoke to cue the virtual flatmate to nod. A second button cued the virtual flatmate's next response to the questions asked by the participant within the interview.

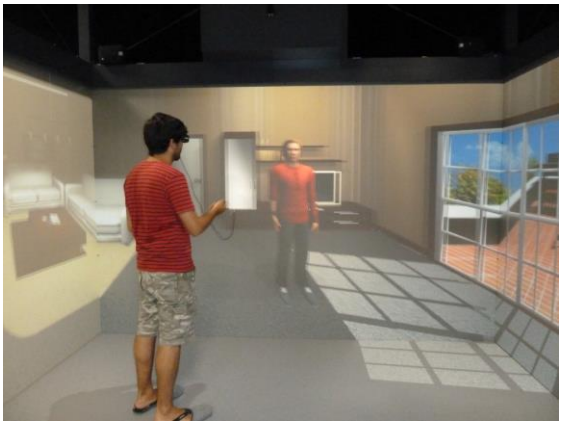
2.5.7 The virtual reality scenario

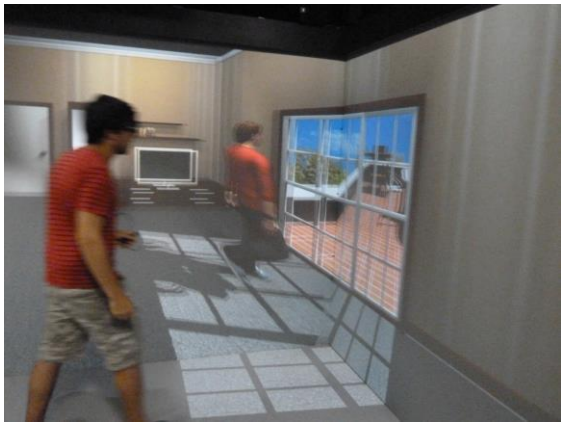
The virtual scenario was designed specifically for the original study which used the same paradigm to examine responses from a non-clinical population (Fornells-Ambrojo et al., 2016), and was programmed by collaborators at the Department of Computer Science at UCL and the University of Barcelona. The scenario was designed to be a neutral and naturalistic experience that was not anxiety provoking. The area of the flat seen was a modern, tidy living room with a sitting area to the left. At the right hand side of the flat, there was a window looking out onto a sunny, pleasant terrace area with a barbecue.

2.5.8 The virtual flatmate (the 'avatar')

The virtual flatmate, named 'Mark', was present at the beginning of the scenario and stood just to the left of centre of the virtual flat, projected onto the back wall of the CAVE. Mark was designed to appear as a young Caucasian male in his early twenties, with appropriate dress. An actor pre-recorded Mark's voice and movements, and the tracker worn by participants on their glasses allowed the avatar's gaze to always be in the direction of the participant. In addition, Mark was programmed to gesture with his arms during conversation, and blink regularly and display subtle baseline ambient body movements throughout the scenario in order to enhance realism. Please see Figure 1 for example images of the virtual reality scenario and the avatar.

Figure 1: Images of the virtual reality scenario in sequence of occurrence





2.5.9 Contingency manipulation

The avatar was programmed to respond in two ways to participants depending on the contingency condition that they were assigned to. In the high contingency condition, the avatar tilted his head slightly a 1.5 second delay after the participant moved their head from side to side. The avatar was also programmed to move his body subtly from side to side (swaying) when a participant moved their head in any other direction. Additionally, the avatar nodded to the participant after every time the participant spoke to him. In the low contingency condition, the same responses were programmed to occur, however after a 20 second delay. They were also over-ridden when another response was awaiting elicitation, or when the avatar was speaking. For the purposes of the current study, contingency conditions were not treated as separate.

2.5.10 Script used in Virtual Reality scenario

The scenario consisted of four main components. An extract from the dialogue can be found in Table 2 below, and the full script is in Appendix 18.

1. Greetings and introductions:

   Here, Mark introduces himself to the participant, and asks for their name. He then states that he is 'ready'.

2. Participant asks questions about flat-sharing, and virtual flatmate responds to each in turn:

   Mark stating that he is ready is the cue for the participant to ask the questions in turn from the prompt sheet. Participants are unaware that the virtual flatmate is unable to respond to spontaneous speech or questions. Participants ask four questions.

3. Virtual flatmate moves to window and invites participant to have a look out at the terrace:

   After the participant has asked their last question, Mark invites (changed to present tense throughout) them to look at the terrace, including using arm gestures.

4. Virtual flatmate receives call and ends conversation:

   Following discussion about the terrace, Mark receives an unexpected phone call. He speaks quietly for a short time, and then explains to the participant that he has to go, and asks whether it is possible to continue talking another time. The scenario fades as the participant responds to this question.

Table 2: Extract from conversation between participant and avatar

Participant Question	**Avatar Response**
(asks third question) **Who makes a good flatmate?**	Mhm... Good question... don't know... I'm trying to think.... Someone who is easy-going, friendly and fun but who also can give you space. It is also good to have something in common with them, like love for sport, or music. It's hard to answer because I think it really depends on the person... I've got on with people who were completely different from me! Sometimes it just works.
(asks fourth and final question) **What would you say is the best thing about this flat?**	The terrace, and the view! Come and have a look! *(Avatar moves to window and looks out before turning back to face participant).* It's amazing to have all this outside space, in the summer we practically live outside! We have great barbecues.

2.6 Measures

2.6.1 Current social connectedness measures

Loneliness

University of California, Los Angeles Loneliness Scale (UCLA) (Russell, 1996): The UCLA Loneliness Scale is a 20-item scale designed to measure respondents' subjective feelings of loneliness as well as feelings of social isolation, with questions such as "I am unhappy doing so many things alone" and "I have nobody to talk to" on a four point scale with the options of "Often, Sometimes, Rarely or Never" feeling the way that statements describe, which are scored from 0-3 (possible maximum score 60). The UCLA has good test-retest and internal reliability (Russell, 1996).

Perceived Social Support

The Significant Others Scale (SOS) (Power et al., 1988): The SOS is a self-report questionnaire which measures subjectively perceived actual and ideal levels of practical and emotional support on a seven-point scale (with possible scores of 1-7), for a maximum of seven people (e.g. mother, friend). This study reports on the perceived actual levels of emotional and practical support offered from the Significant Others in a respondent's life. Practical support includes questions like "Do they give you practical help?", whereas emotional support encompasses questions such as "Can you lean on and turn to this person in times of difficulty?". The measure has been shown to have satisfactory concurrent and construct validity and test–retest reliability (Power et al., 1988) and has been used in a First Episode Psychosis population in previous research (Tempier, Balbuena, Garety, & Craig, 2012).

Availability of Social Resource

Resource Generator – UK (RG-UK) (Webber & Huxley, 2007): The RG-UK is a 40-item measure which assesses a respondent's level of social capital. Respondents report their access to

other people with a particular skill or resource, for example someone who could fix their car or who is knowledgeable about local government. If they do have access to such an individual, the proximity to this individual is recorded (from an immediate family member to an acquaintance). The total social capital score is utilised for this study. The measure is reported to have good psychometric properties and has been used in previous research with a general population sample (Webber & Huxley, 2007) as well as with individuals with severe mental health problems (Dutt and Webber, 2010).

Social Interaction Ability

First Episode Social Functioning Test (FESFS) (Lecomte et al., 2014): The FESFS is a self-report social functioning rating scale investigating both ability and frequency of behaviours on multiple domains of social functioning. Each question has two parts rated from 1 (never/totally disagree) to 4 (always/totally agree). Part A assesses the respondent's perceived ability to complete the behaviour, and Part B assesses the frequency of this behaviour. This research utilises the 'ability' scores on two of the FESFS subscales: The 'Interacting with people' subscale examines a respondent's contact with everyday social situations, for example interacting with shop staff and acquaintances (e.g. "I find it easy to talk with people my own age I know just a little bit"). The 'Friends and activities' subscale examines how a respondent spends their time day to day, including solo activities and the characteristics of their friendship circle (e.g. "I feel I have at least one best friend with whom I can share important things that happen to me"). Preliminary validation of the measure shows it to have good test-retest reliability within a First Episode Psychosis population (Lecomte et al., 2014).

2.6.2 Attachment measure

The Relationship Questionnaire (RQ) (Bartholomew & Horowitz, 1991): The RQ is a brief self-report measure of adult attachment style. Respondents first indicate which description of

relationship style best describes their general style of relating from a choice of four. They subsequently rate all four styles as to how well they each matched their general relationship style, on a seven-point scale. The relationship styles correspond to the proposed four adult attachment styles of 'secure', and 'insecure fearful', 'insecure preoccupied' and 'insecure dismissive'. This study uses the dichotomous measure of secure versus insecure attachment in its analyses. The RQ has been found to show good construct, convergent and discriminant validity and has been used widely in previous research (Griffin & Bartholomew, 1994).

2.6.3 Symptoms measures

Community Assessment of Psychic Experiences (CAPE) (Konings et al., 2006) The CAPE is a self-report measure of psychotic experiences across positive symptom, negative symptom and depressive symptom domains. The CAPE consists of 42 statements describing experiences consistent with these three domains (e.g. "Do you ever feel as if you are being persecuted in some way?", a positive domain statement) which respondents rate first in terms of the frequency that they experience them on a four-point scale (from 'never' to 'nearly always'), with a range of scores from 0-3. If they experience the symptom, respondents then rate the amount of distress that the experience causes them on a second four-point scale (from 'not distressed' to 'very distressed'). Overall scores for frequency and distress, as well as domain specific scores, can then be calculated. The CAPE has been shown to yield stable, reliable and valid results in a general population sample (Konings et al., 2006). Overall CAPE scores and domain specific frequency scores only will be utilised for this study.

Paranoia Scale (PS) (Fenigstein & Vanable, 1992): The PS is a 20-item self-report measure of paranoia, which includes ideas of persecution and ideas of reference such as "I believe that I have often been punished without cause" and "Someone has been trying to influence my mind". Items are rated on a five-point scale, ranging from 1 (not at all applicable to me) to 5

(extremely applicable to me). The PS is the most widely used measure of trait paranoia, and has been well-validated with good test-retest reliability, internal reliability, and convergent validity (Freeman et al., 2005).

2.6.4 Post virtual reality measures

Virtual Reality Measure: Distance Kept from Avatar (Fornells-Ambrojo et al., 2016): Whilst participants were in the virtual reality environment, the distance that they kept from the virtual flatmate in metres was recorded automatically. The minimum distance kept from the virtual flatmate after they had been invited to look at the terrace from the window is taken as an objective, behavioural measure of trust (Bailenson et al., 2003). This is completed by recording the 3D positions of the virtual flatmate and the participant's head at each animation frame utilising the sensors on the 3D glasses that the participant wore during the paradigm, and the distance between them calculated in terms of the horizontal Pythagorean distance (meaning that any height difference did not impact on the results). This measure uses the same calculation as the previous study by Fornells-Ambrojo et al. (2016), allowing for comparison between the two samples.

Attention checks: (Fornells-Ambrojo et al., 2016): To check whether participants had been paying attention to the content of the virtual flatmate's responses to their questions, they were then asked two 'true or false' questions about what he had disclosed during the interaction. Again, these are the same measures used in the original study, allowing for comparison between the two samples.

Sense of Presence Questionnaire (SOP) (Slater et al., 1998): The SOP is a 6 item self-report measure, which examines the extent to which participants felt present in the virtual flat rather than in their physical location, based on their experiences and the quality of the memory of the situation. Respondents rate items such as "When you think back about your experience, do you think of the virtual flat more as 'images that you saw' or 'somewhere you

visited'?" on a 7-point scale, where higher scores indicate a higher level of immersion in the virtual environment.

Trust in Close Relationships – adapted version (TICR)(Rempel et al., 1985): This adapted version of the TICR has 17 self-report questions, which asked respondents to rate their feelings of trust in the virtual flatmate. The questionnaire was prefaced with a statement acknowledging that participants had only met the virtual flatmate for a few moments, and that the questionnaire was therefore based on their first impressions of him. Responses could be rated from -3 'strongly disagree' to 3 'strongly agree', and included statements such as "Mark looks like someone who would think about me if we were making a decision" and "I would feel comfortable confiding in Mark". This allowed a fuller understanding of the participants' subjective trust in the virtual flatmate to be understood. On analysis, the scores from this scale were transformed to range between 1 and 7.

Subjective Trust: A simple rating of subjective trust of avatar was recorded using the question "On a scale of 1 – 7, how trustworthy did you perceive the avatar to be?" Participants then rated subjective trustworthiness on a seven-point Likert Scale.

2.7 Data Analysis

For the purpose of this research, the two contingency conditions were combined and treated as a single group. Data analysis took two forms: Confirmatory (Statistical) Data Analysis and Exploratory (Graphical and Non-Graphical) Data Analysis (Tukey, 1977). This method of analysing small datasets is used widely within clinical psychology research (Barker, Pistrang, & Elliot, 2002) and aligns well with statistical analysis methods (Behrens, 1997). EDA included visual inspection of histograms and stem-and-leaf plots, and production of graphical representations of data utilising box plots and scatter plots, and is included throughout the results where relevant.

2.7.1 Analysis of social connectedness

Spearman's Rho non-parametric correlations were conducted on social connectedness and attachment style variables to discover potential associations in construct. To address the risk of Type I error due to multiple comparisons, Bonferroni corrections were applied to all correlational analyses, and it is noted when the corrected statistic level remained significant.

2.7.2 Analysis of association between symptoms of psychosis and trust

Spearman's Rho non-parametric correlations were conducted between symptoms measures and trust variables to discover potential associations. To address the risk of Type I error due to multiple comparisons, Bonferroni corrections were applied to all correlational analyses, and it is noted when the corrected statistic level remained significant.
The following statistical analyses were conducted to test the study hypotheses:

2.7.3 Links between social connectedness and subjective trust

To investigate hypothesis 1 which predicted that higher levels of social connectedness will be associated with ability to trust another person, Spearman's Rho non-parametric correlations were conducted between the social connectedness variables and perceived ability to trust the avatar (TICR). To protect against inflated Type I error rates due to multiple comparisons, Bonferroni corrections were applied to all correlational analyses, and it is noted when the corrected statistic level remained significant.

2.7.4 Links between social connectedness and objective trusting behaviour towards avatar

To investigate hypothesis 2 which predicts that higher levels of social connectedness will be associated with higher levels of trusting behaviour, Spearman's Rho non-parametric

correlations were conducted between social connectedness variables and the minimum distance kept from the avatar at the window. To protect against inflated Type I error rates due to multiple comparisons, Bonferroni corrections were applied to all correlational analyses, and it is noted when the corrected statistic level remained significant.

2.7.5 Links between attachment and trust and objective trusting behaviour towards avatar

To investigate hypothesis 3, which predicts that the attachment style of an individual with clinical paranoia will influence the level of subjective trust and objective trusting behaviour exhibited, Spearman's Rho non-parametric correlations were conducted between the secure and insecure dimensional score on the RQ and the TICR, and the RQ and the minimum distance kept from the avatar at the window. To protect against inflated Type I error rates due to multiple comparisons, Bonferroni corrections were applied to correlational analyses and it is noted when the corrected statistic level remained significant.

Two Mann-Whitney U Tests were performed between dichotomised secure and insecure attachment ratings and subjective trust and objective trusting behaviour to ascertain any difference.

3. Results:

3.1. Demographic and clinical details

The final sample consisted of eighteen male participants. The sample had a mean age of 26.3 (SD = 5.57). Participants described themselves as a variety of ethnicities; most frequently White British (44.4%).

Mental health diagnoses consisted of F20-F29 diagnoses of schizophrenia, schizotypal and delusional disorders (World Health Organisation, 1993). Vocationally, the

sample comprised mostly of individuals who were in some form of employment or education (76.5%). Table 3 gives demographic and clinical data from the sample.

Table 3: Demographic and clinical data

Type	Variable	Summary Statistic
Demographic	Age, *mean (SD)*	26.3 (5.57)
	Ethnicity, *n (%)*	
	White British	8 (44.4%)
	Other	10 (55.6%)
	Employment status*, *n (%)*	
	In education	6 (35.3%)
	Employed	7 (41.2%)
	Unemployed	4 (23.5%)
Clinical	CAPE+, *mean (SD)*	
	Total CAPE	3.16 (1.39)
	Positive Frequency	1.77 (0.54)
	Negative Frequency	2.05 (0.85)
	Depressive Frequency	2.22 (0.87)
	Paranoia scale, *mean (SD)*	
	Total Paranoia Scale	56.78 (4.02)

Notes: *Total n=17. n = 1 participant did not give employment status data, which was collected in the qualitative interview. +Total n=11. n = 7 participants did not complete the CAPE

Participants showed a higher frequency of negative and depressive symptoms than positive symptoms of psychosis, as reported in the CAPE. With scores on the Paranoia Scale (PS) ranging from 30 to 88 (mean = 56.78, SD = 4.02), study participants reported experiencing comparable levels of paranoia to an early psychosis sample with current persecutory delusions (mean = 57.48, SD = 13.9) (Langdon, Still, Connors, Ward, & Catts, 2013), and marginally higher mean levels of paranoia symptoms than non-clinical participants with high levels of paranoia (mean = 53, SD = 5.88) (Fornells-Ambrojo et al., 2016). The study sample's total score on the CAPE (mean = 3.16, SD = 1.39) was lower than a comparable study of ultra-high risk individuals (mean = 4.2, SD = 1.0) (Mossaheb et al., 2012).

3.2 Data Screening

3.2.1 Missing data

All participants completed the core measures of current social connectedness, and measures of trust of avatar. Due to participants' time constraints, n=3 did not complete the FESFS, and n=7 did not complete the CAPE, as these were considered secondary measures to the project. One participant gave a double response on the TICR. The more conservative lower score was utilised in analysis. Another participant did not complete the full debrief interview due to fatigue, however was still debriefed according to protocol.

3.2.2 Statistical assumptions

The planned data analysis had involved screening data for normality through the inspection of skew, kurtosis, using the Shapiro Wilk statistic for normality and outliers; and utilising the appropriate parametric and non-parametric test accordingly. However due to the low sample size (n = 18), and the fact that not all participants had completed every questionnaire utilised in the analytic procedure, non-parametric tests were considered to be the most robust method across all analyses.

3.2.3 Outliers

All data was screened for outliers. One outlier was apparent in responses to the Significant Others Scale. During testing, the respondent had stated that they did not feel that they had any significant others when completing, resulting in scores of zero for actual levels of practical and emotional support. Although this resulted in an outlying variable, the small sample size coupled with the participants' qualitative feedback merited the preservation of this outlier within the analysis. Statistical testing with this value included and excluded did not change significant values in the data analysis.

3.3 Social connectedness variables

Table 4 gives total and domain specific scores from the four questionnaires examining participants' current social situation: the Significant Others Scale (SOS), the University of California, Los Angeles Loneliness Scale (UCLA), the Resource Generator UK (RG-UK) and the First Episode Social Function Scale (FESFS). The mean total number of significant others (SO) reported in the SOS was higher than total SO from FEP patients in previous research (Tempier, Balbuena, Garety, & Craig, 2012), (mean = 3.67, SD = 1.78 versus mean = 1.71, SD = 1.06 respectively). There was also relatively fewer parents and greater proportion of friends and siblings considered as significant others in the present study sample. Mean levels of perceived actual social support were comparable to those of the FEP sample (Tempier, Balbuena, Lepnurm, & Craig, 2013). Loneliness levels, as reported by the UCLA, for the study sample was in fact lower than those from a general population study (Russell, 1996),with a mean of 31.52 versus 40.8 in the general population study. Measurements of access to social capital from the RG-UK were slightly higher than those taken from a sample population with depression (Webber et al, 2011). A general population sample (mean = 17.24), shows better comparison with this study sample (mean = 16.94) (Webber & Huxley, 2007). Overall, therefore, the study sample seems slightly less impaired on social connectedness variables than a typical FEP sample may be. The study sample scored comparably on the social functioning ability (FESFS) subscales of 'Interacting with People' (mean = 3.12, SD = 0.48) and 'Friends and Activities' (mean = 3.12, SD = 0.56) to another FEP sample (Lecomte et al., 2014), (mean = 3.07, SD = 0.56; and mean = 2.94, SD = 0.54) respectively.

Table 4: Descriptive statistics for social connectedness measures

Measure	Variable	Mean (SD)
Resource Generator UK (RGUK)	**Availability of Social Resource**	
	Total Social Capital	16.94 (5.85)
Significant others scale (SOS)	**Perceived actual support**	
	Perceived actual emotional support	5.19 (1.17)
	Perceived actual practical support	4.61 (1.64)
First episode social functioning scale (FESFS)	**Social functioning ability**	
	Interacting With People - Ability	3.12 (0.48)
	Friends and Activities - Ability	2.71 (0.56)
UCLA Loneliness Scale	**Loneliness**	
	Total Loneliness	31.52(12.71)

Notes: FESFS based on n = 15.

3.3.1 Relationship between social connectedness variables

Relationships between social connectedness measures were explored to evaluate potential overlaps between the social connectedness constructs. Table 5 shows Spearman's rho correlations between these variables.

Table 5: Spearman's Rho correlations of social connectedness variables

Measure	Variable	Total Social Capital	Perceived emotional support	Perceived practical support	Interacting With People	Friends and Activities
		Rho *p*	Rho *p*	Rho *p*	Rho *p*	Rho *p*
Resource Generator UK (RGUK)	Total Social Capital	-				
Significant others scale (SOS)	Perceived emotional support	426 *.078*	-			
	Perceived practical support	.474* *.047*	.517* *.028*	-		
First episode social functioning scale (FESFS)	Interacting With People - Ability	.504 *.056*	.372 *.173*	.704** *.003*	-	
	Friends and Activities - Ability	.263 *.343*	.419 *.120*	.594 *.020**	.652** *.008*	-
UCLA Loneliness Scale	Total Loneliness	-.290 *.243*	-.282 *.256*	-.455 *.058*	-.482 *.069*	-.513 *.051*

Notes: FESFS correlations based on n = 15. *= significant at 0.05 level. **= significant at 0.01 level.

A significant positive association was found between perceived practical support (SOS) and access to social capital (RG-UK). There was no significant association between perceived emotional support (SOS) and social capital.

Lower feelings of loneliness (UCLA loneliness scale) showed negative trends with responses to the two social functioning subscales (FESFS): the ability to interact with pe ople and the ability to spend time with friends or on meaningful solo activities. Loneliness was additionally moderately negatively associated with perceived practical support, but this association was also at the trend level. Again, this result was not replicated for perceived emotional support.

To protect against inflated Type I error rates due to multiple comparisons, the Bonferroni correction was applied to the correlational analyses, giving Bonferroni adjusted $\alpha = 0.001$ (0.05/36). At this level of α, none of the previous statistical associations remained significant.

3.4 Attachment

Table 6 shows descriptive statistics from the Relationship Questionnaire. Due to the low sample size, attachment styles were dichotomised into 'secure' and 'insecure' for the purposes of the analysis. The majority of respondents (67%) categorised themselves as insecurely attached.

The most frequently endorsed attachment style was of dismissive attachment (38.89%). This is higher than in young adults from the general population, where approximately 53% of those completing the RQ fitted an insecure attachment style, with only 18% identifying themselves dismissively attached (Bartholomew & Horowitz, 1991).

Table 6: Descriptive statistics of attachment style as assessed by the Relationship Questionnaire (RQ)

Measure	Main attachment style category selected	Dimensional score#	
	N (%)	Mean	SD
Secure Attachment	6 (33.33%)	4.18	1.67
Insecure Attachment	12 (67%)	4.00	1.06
Fearful Attachment	4 (22.22%)	3.77	1.68
Preoccupied Attachment	1 (5.56%)	3.77	1.25
Dismissive Attachment	7 (38.89%)	4.47	1.77

Notes: # Dimensional scores based on n= 17 as one participant did not complete this part of the RQ

3.5 Sense of presence and attention checks within the Virtual Reality scenario

The degree to which participants felt immersed within the virtual reality environment, as measured by the Sense of Presence Questionnaire, ranged from 8 to 39 (mean 24.9, SD = 9.77). This was similar to the previous study (Fornells-Ambrojo et al., 2016) which utilised the same virtual reality scenario with a non-clinical group (mean 25.47, SD = 6.52, range = 11), and to a non-clinical group (mean = 23.7) in a previous virtual reality scenario (Fornells-Ambrojo, 2007) which utilised a virtual tube train.

The majority (66.7%) of the present study sample answered the attention check questions (fact checks about what the avatar had said during the scenario) correctly. This is a lower figure than in the previous study using this scenario, where 90.2% of respondents answered both questions correctly.

These findings may suggest that participants in this sample were paying less attention to the paradigm than in the previous study, however the Sense of Presence checks imply that they were nevertheless sufficiently immersed in the scenario. Full details of the feasibility of utilising a virtual reality environment for research with individuals with clinical paranoia can be found in the joint researcher's thesis (GW).

3.6 Trust in the virtual reality avatar

Trust of the avatar was measured using both subjective (questions about trust) and objective (behavioural) measures.

Subjective trust was measured using a single self-report question, as well as the adapted 17 item Trust in Close Relationships Scale (TICR). Participants rated the avatar at a mean level of trustworthiness of 4.72 (SD = 1.67), meaning that participants rated the avatar as marginally less trustworthy than non-clinical participants with high levels of paranoia (Fornells-Ambrojo et al., 2016) study using the same scenario (mean 5.43, SD = 0.54). Scores on the TICR ranged widely from 33 to 113 (mean 78.6, SD = 18.8). These subjective ratings of Trust (Trust and TICR) were significantly positively associated with one another (r_a = .817, p<0.0005), therefore the fuller measure of trust (TICR) was taken forward to use within further analyses.

Objective trust behaviour was calculated from the minimum distance in metres that the participant kept from the avatar when invited to walk over to the window and look out at the terrace (mean = 1.02, SD = 0.42). This was marginally larger than the distance observed in the non-clinical sample (mean = 0.92, SD = 0.23) of the original study (Elenbaas, 2013).

The subjective and objective measures of trust of the avatar (TICR and minimum distance) did not relate to one another (r_a = -.296, p = .232).

3.6.1 Trust and symptoms of psychosis

Table 7 shows associations between symptoms of psychosis and trust of avatar. Only one statistically significant association was found, between positive symptoms of psychosis (CAPE) and subjective trust. When the Bonferroni correction was applied to this

correlation, giving a Bonferroni adjusted α = 0.01 (0.05/5), the result was no longer significant.

Table 7: Spearman's Rho non-parametric correlations between symptom and trust measures

	Subjective Trust (TICR)	Objective Trusting Behaviour (Minimum distance to avatar)
	Rho *(p)*	Rho *(p)*
Total CAPE	-.200 *.555*	.155 *.650*
Positive Symptom Frequency (CAPE)	-.606* *.048*	.238 *.481*
Negative Symptom Frequency (CAPE)	.050 *.884*	.269 *.424*
Depressive Symptom Frequency (CAPE)	-.091 *.789*	.096 *.779*
Total Paranoia (PS)	-.038 *.880*	.040 *.874*

Notes: * = significant at .05 level. CAPE based on n = 11.

3.7 Study Hypotheses

3.7.1. A higher level of social connectedness in everyday life will be associated with increased subjective trust towards the avatar (hypothesis 1)

Measures of social connectedness (SOS, UCLA loneliness, RG-UK and FESFS) did not show significant associations with experienced trustworthiness of the avatar (see Table 8 for full statistics).

Exploratory Data Analysis found that a higher perception of loneliness from the UCLA loneliness scale seemed to be associated with lower levels of reported trust of the avatar, however this result was not statistically significant. Figure 2 shows the graphical relationship between these variables.

Figure 2: Loneliness and objective trusting behaviour towards avatar

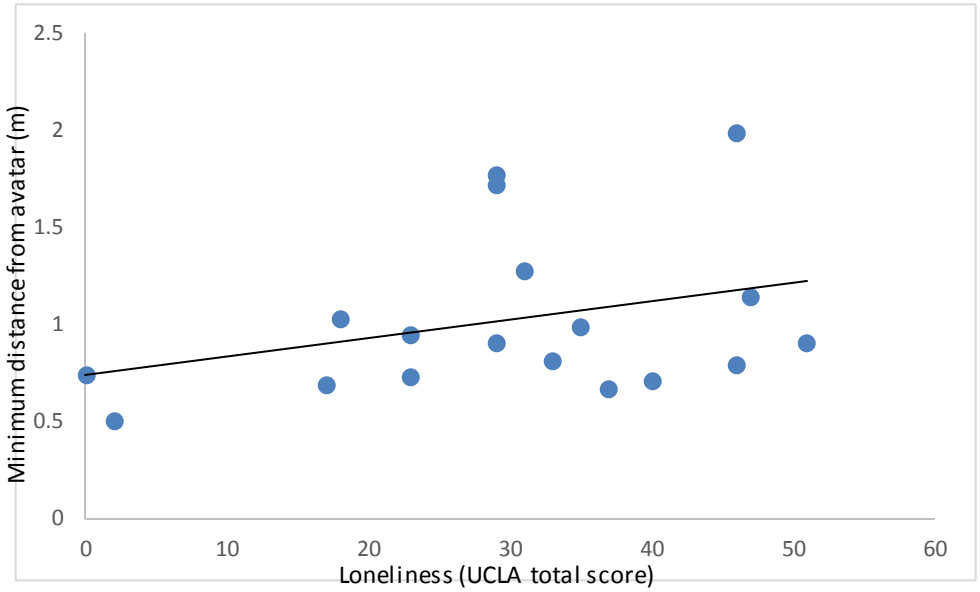


Table 8: Spearman's Rho non-parametric correlations between measures of social connectedness and subjective and objective trust of avatar

Social Connectedness Measure	Subjective Trust (TICR)	Objective Trust (Min distance to the avatar)
	Rho *(p)*	Rho *(p)*
Total Social Capital (RG-UK)	.281 *(.259)*	-.580* *(.012)*
Perceived emotional support (SOS)	.114 *(.653)*	-.377 *(.123)*
Perceived practical support (SOS)	.274 *(.272)*	-.666** *(.003)#*
Interacting with People Ability FESFS)	.146 *(.602)*	-.826** *(>.001)#*
Friends and Activities Ability (FESFS)	.224 *(.422)*	-.498 *(.059)*
Loneliness (UCLA)	-.322 *(.193)*	.276 *(.268)*

Notes: FESFS based on n=15. * Correlation is significant at 0.05 level. ** Correlation is significant at 0.01 level. #Bonferroni corrected statistic remains significant.

3.7.2. A higher level of social connectedness in everyday life will be associated with trusting behaviour towards the avatar (hypothesis 2)

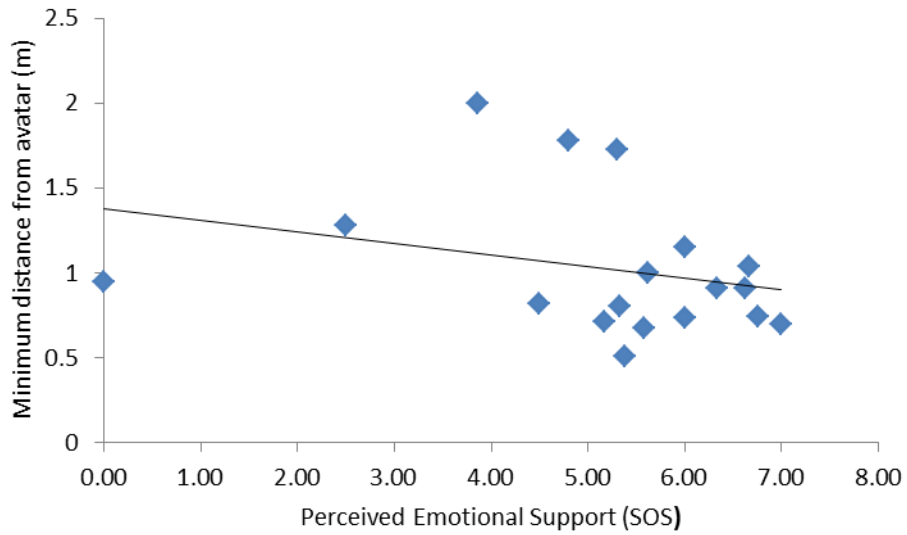
Trusting behaviour, operationalised as the minimum distance kept from the avatar at the window, was associated with access to social capital (r_a = -.580, p = .012), perceived practical support, (r_a = -.666, p = .003), and ability to interact with people. (r_a = -.826, p

>.001). Higher levels of these social connectedness measures therefore predicted participants moving closer to, and thus displaying higher levels of trusting behaviour towards the avatar. Table 8 shows full correlations.

Figure 3 shows that although not significant, perceived emotional support also displays a negative association with distance kept from the avatar at the window. Figure 4 further suggests that although not significant, the friends and activities domain of social function also displays a negative association with minimum distance from avatar.

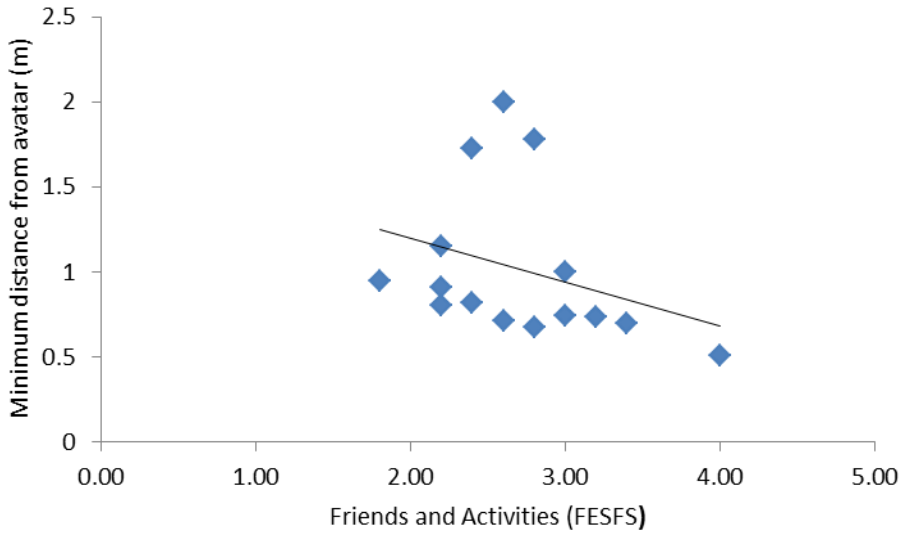
To protect against Type I error due to multiple analyses, the Bonferroni correction was applied to the correlational analyses, giving Bonferroni adjusted $\alpha = 0.008$ (0.05/6). At this level of α, perceived practical support, and interacting with people ability remained significantly correlated to objective trust.

Figure 3: Level of perceived support and objective trust of avatar



Note: Outlier remained in study, as justified in data screening section of results

Figure 4: Social function and objective trust of avatar



3.7.3 Insecure attachment will be associated with reduced subjective trust and trusting behaviour towards the avatar (hypothesis 3)

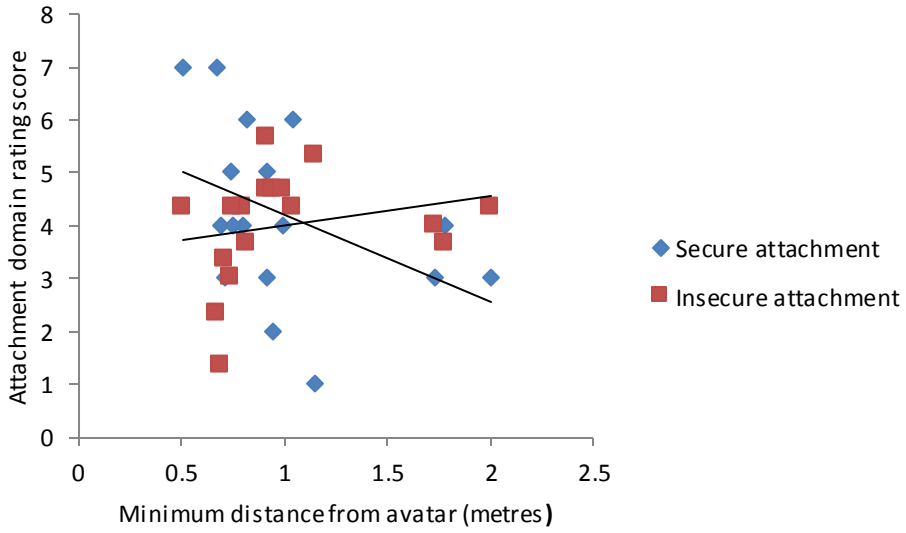
It was hypothesised that the attachment style of an individual with clinical paranoia would influence the subjective level of trust reported and objective trusting behaviour exhibited.

Subjective trust of the avatar did not show associations with strength of secure attachment rating (r_s = .212, p = .414), or strength of insecure attachment rating (r_s = -.197, p = .449).

A higher self-rating of secure attachment was negatively associated with the minimum distance kept from the avatar (r_s = -.513, p = .035), meaning that a higher rating of secure attachment was related to getting closer to the avatar. Conversely, a higher self-rating of overall insecure attachment style showed a positive trend with the minimum distance kept from the avatar, although this relationship was not statistically significant (r_s =.462, p = .062). Figure 5 displays these two relationships graphically.

When the Bonferroni correction was applied to the correlational analyses, Bonferroni adjusted $\alpha = 0.01$ (0.05/4). At this level of α, statistical associations between these variables were no longer significant.

Figure 5: Attachment style and distance kept from avatar at window



Two Mann-Whitney U tests were performed to explore differences in the levels of trust between the dichotomised secure versus insecure forced-choice category rating, where individuals were asked to select which attachment style applied to them most. In this case, individuals who reported having a secure attachment style (Mdn = 5.35) reported higher levels of subjective trust towards the avatar than individuals with an insecure attachment style (Mdn = 4.59), however this was not statistically significant ($U = 17.0$, $z = 10.67$, $p = .083$). Figure 6 is a box plot demonstrating this relationship.

Participants reporting to have a secure attachment style displayed higher levels of objective trust and moved closer to the avatar at the window (Mdn = 0.716) than those who reported having an insecure attachment style (Mdn = 0.971), $U = 61.0$, $z = 10.67$, $p = .018$). Figure 7 is a box plot displaying this relationship.

Figure 6: Boxplot of attachment style and subjective trust of avatar

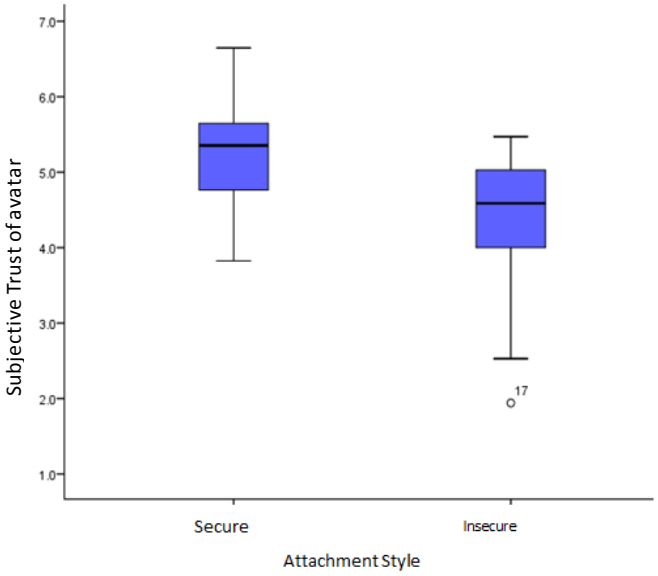
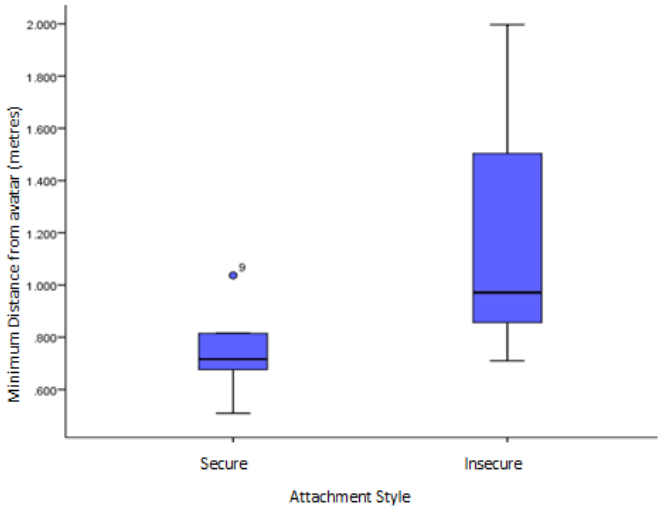


Figure 7: Boxplot of attachment style and objective trust of avatar



Note: Objective trust measured as minimum distance kept, therefore lower score implies that respondent moved closer towards avatar (thus displaying higher objective trust behaviour).

3.7.4 Post hoc tests

Mann-Whitney U Tests were performed to assess for associations between dichotomised secure and insecure attachment ratings and the three measures of social connectedness significantly associated with objective trusting behaviour: practical support (SOS), ability to interact with other people (FESFS) and total social capital (RG-UK). Attachment security was significantly related to ability to interact with other people (Secure

Mdn = 3.50, Insecure Mdn = 2.75) (U = 7.0, z = -2.231, p = .026) and access to social capital (Secure Mdn = 23.0, Insecure Mdn = 14.0) (U = 11.0, z = -2.369, p = .018), however not with practical support (Secure Mdn = 5.13, Insecure Mdn = 4.25) (U =22.0, z = -1.312, p = .19).

4. Discussion

4.1 Summary of findings

This study investigated the role of social connectedness on interpersonal trust using an experimental virtual reality paradigm. Objective trusting behaviour, which was operationalised by the minimum distance that the participant kept from the avatar (Bailenson et al., 2003), was associated with several social connectedness variables: self-related functioning ability in every day interpersonal interactions, perceived levels of practical social support, and access to social capital. Secure attachment, both dimensionally and as a category, was associated with higher objective trust; demonstrated by seeking closer proximity to the avatar. These associations did not appear to be present with regard to levels of subjective trust of the avatar.

Despite the small sample size, these findings indicated that there are links between social connectedness variables and attachment style with objective trusting behaviour towards another individual in participants with clinical paranoia. Potential mechanisms for these associations are explored below.

4.2 Social connectedness and objective trusting behaviour

4.2.1 Objective trust in clinical paranoia

The minimum interpersonal distance maintained by participants from the avatar was assumed to be a measure of objective trusting behaviour (Bailenson et al., 2003). This

relates to proxemic patterns of behaviour: the processes that govern the amount of interpersonal space needed in different circumstances, for example the different distance maintained between two friends versus strangers, or the act of moving backwards if another person approaches suddenly. Once learned, proxemic behaviours are understood to be dynamic and maintained mostly out of conscious awareness (Hall et al., 1968). Evidence for proxemic processes towards avatars has been found in previous virtual reality paradigms (Bailenson et al., 2003; Yee, Bailenson, Urbanek, Chang, & Merget, 2007).

Individuals with psychosis maintain a greater interpersonal distance from others than individuals without psychosis (Duke & Mullens, 1973; Nechamkin et al., 2003; Park et al., 2009); this has been found to be associated specifically with levels of negative symptoms and with level of current paranoid threat (Schoretsanitis et al., 2016). Social avoidance can be conceptualised as a negative symptom of psychosis through processes of social withdrawal and self-isolation due to blunted affect and a lack of desire for affiliation (Hansen, Torgalsbøen, Melle, & Bell, 2009; Wagman, 1998). Accordingly, participants within the current study appeared to keep a larger minimum distance from the avatar than non-clinical participants from a previous study utilising the same paradigm (Fornells-Ambrojo et al., 2016).

4.2.2 Conceptual relationship between social connectedness variables

Within the investigated measures of social connectedness that were found to show associations with objective trusting behaviour, perceived practical support (SOS) was linked with access to social capital (RG-UK). The perceived level of functional ability in interactions with other people (FESFS) was also significantly associated with perceived practical support, and appeared to be linked at a positive trend level with access to social capital.

These measures all align with principles of social support (Cohen, 2004) and social integration (Brissette et al., 2000). Social support is thought to be beneficial to outcomes of

individuals with psychosis in two ways. Firstly, social integration helps individuals to emotionally regulate and maintain productive routines to directly improve their health outcomes (the main effect of social support). Secondly, social connectedness acts as a stress-buffer to provide emotional support in times of physical or mental distress including the onset of psychosis, to allow coping mechanisms to be activated (Cohen, 2004).

Specifically, the three inter-correlated measures were found to include similar constructs. Whilst social functioning investigates the ability an individual perceives they hold to manage within everyday social situations, and practical support considers the presence of significant figures that can provide resource and general social interaction, social capital can be considered a measure of the respondent's evaluation of their environment, their social networks, and the level of participation within their community. All three variables therefore pertain to respondents' appraisal of the availability of help and the degree to which they felt that they could access resources, socialise and communicate with people around them in a useful fashion, without including more intimate and emotional needs (De Silva et al., 2005; Lecomte et al., 2014; Power et al., 1988; Webber & Huxley, 2007).

4.2.3 Social connectedness and exposure to behavioural norms

Respondents scoring at a higher level within this subset of social connectedness variables may experience a greater frequency of everyday social interactions and therefore possess a greater general knowledge of social skills. Social skills are learned behaviourally through reinforcement and include non-verbal factors such as interpersonal distance (Bellack, Mueser, Gingerich, & Agresta, 2013); a proxemic factor. Repeated exposure to normative experiences of interpersonal interactions would therefore allow individuals to learn or maintain normative levels of proxemic dynamics such as interpersonal distance from those around them via Social Learning Theory (Bandura & Walters, 1963). Accordingly,

individuals with psychosis who are typically socially isolated have been shown to prefer larger interpersonal distances in experimental investigations (Duke & Mullens, 1973; Park et al., 2009).

In the present study, a smaller distance maintained from the avatar was comparable with the distance kept by non-clinical participants from the previous research utilising this paradigm (Fornells-Ambrojo et al., 2016). Understanding appropriate interpersonal distance is an aspect of social skills training (Bellack et al., 2013) which is shown to be effective in the treatment of psychosis (Kurtz & Mueser, 2008; Pilling et al., 2002).

4.2.4 Social functioning and social cognition

Over and above behavioural reinforcement of a normative interpersonal distance from the avatar, the ability to understand social situations may also allow more appropriate objective trusting behaviour to be exhibited in individuals with paranoia. Social functioning is thought to have close links with social cognition; defined as the ability to construct representations of the relation between self and other and to use this to flexibly guide social behaviour (Adolphs, 2001). Intact social cognition ability allows quick processing of the social stimuli essential for successful interpersonal interactions including social cues such as eye contact and body language, which improves social functioning outcomes (Couture et al., 2006). Accordingly in psychosis populations, a reduced knowledge of social situations is associated with higher levels of paranoia (Cutting & Murphy, 1990).

Social cognition and social function also link with Theory of Mind (ToM), involving the ability to infer others' mental states. The ToM impairments often reported within individuals experiencing paranoia (Brüne, 2005; Frith, 2004; Lysaker et al., 2010) may influence the ability for any flexibility of appraisal of the avatar, and resultant potential to alter levels of trusting behaviour accordingly.

Higher levels of social functioning ability may therefore be associated with objective trusting behaviour due to an increased ability to understand the social situation and act accordingly.

4.2.5 Social withdrawal as a safety behaviour

Maintaining a larger distance from the avatar may also be conceptualised as a form of avoidance stemming from mistrust. Social support gives individuals a role in society and exposes them to positive affiliative interpersonal experiences which will help to foster trust (Cohen, 2004), as well as access to social behavioural norms (Hall et al., 1968) Active social avoidance is linked with positive symptoms of psychosis; paranoid beliefs about others cause individuals with the condition to avoid contact with others (Hansen et al., 2009). The avoidance of moving too close to the avatar could thus be conceptualised as a safety behaviour (Freeman et al., 2002; Wells et al., 1996). In individuals experiencing paranoia, an initial suspicious appraisal of the avatar due to paranoid traits may result in safety behaviours such as maintaining a greater distance from the avatar being elicited, which is designed to reduce the perceived threat from the avatar. The lack of negative events that occur during the virtual reality scenario is then appraised to be due to the success of the safety behaviour rather than to benign characteristics of the social interaction itself. In making this assumption, potential disconfirmatory evidence against the initial mistrustful appraisal is rendered ineffective, and the paranoid belief is strengthened (Freeman et al., 2002).

4.3 A dynamic process

Whether conceptualised as behavioural norms, social cognition skill or safety behaviour, increased levels of social connectedness appeared to predict a greater level of

objective trust towards the avatar in the current study. Social connectedness can therefore be hypothesised to play an important role in processes determining trust for individuals with clinical paranoia. Little is known about how social factors influence the mechanisms underlying formation and maintenance of paranoia and persecutory delusions; however it is probable that the process is a dynamic one involving multi-directional processes and other fluctuating factors (Bentall et al., 2001).

Individuals experience a reduction in the size of their social network shortly before or at the onset of psychosis (Gayer-Anderson & Morgan, 2013; Palumbo, Volpe, Matanov, Priebe, & Giacco, 2015), which may impact levels of social connectedness. It is difficult to determine whether symptoms of psychosis are in part a result of this isolation, or whether symptoms served to precipitate social withdrawal (Horan, Subotnik, Snyder, & Nuechterlein, 2006). Moreover, symptoms listed as part of the condition include social withdrawal (both of a passive nature, implicated with negative symptoms; and of an active nature, implicated with paranoia), meaning that clinical symptoms and functional correlates of the condition are bound together within the conceptual understanding of psychosis (Kirkpatrick, Fenton, Carpenter, & Marder, 2006; Wagman, 1998).

In a real-world setting, the result of maintaining greater interpersonal distance from an individual due to an objective lack of trust may result in that individual responding accordingly with suspicion (Freeman et al., 2007). This would perpetuate a mutual feeling of mistrust. This negative feedback may compound social withdrawal, both from the prevention of disconfirmatory evidence of the belief, and from the negative feedback of others. Similarly, research suggests that social skill level is predictive of the 'perceived strangeness' of interactions with an individual with psychosis. This in turn leads to feelings of social difference and stigmatisation from other individuals interacting or observing them (Penn, Kohlmaier, & Corrigan, 2000). Stigma will serve to perpetuate social withdrawal in individuals with psychosis, increasing levels of shame and social withdrawal and further

exacerbating their differences in interactions (Mueser & Tarrier, 1998). Levels of self-esteem may further be implicated with these processes of withdrawal; it is widely argued that self-esteem is unstable within individuals with symptoms of paranoia, and therefore negative social experiences may result in negative social comparisons, resulting in further social withdrawal (Bentall et al., 2001; Thewissen, Bentall, Lecomte, van Os, & Myin-Germeys, 2008).

Due to the fact that participants were already experiencing clinical levels of paranoia, the design of this study renders it difficult to identify specific directions between these complex links. Future research may examine these processes with comparison groups that are in remission or recovered from psychosis, with mental health difficulties without current active paranoia, or within individuals of an At Risk Mental State of developing psychosis to understand more about whether these mechanisms are applicable specifically within actively paranoid individuals.

It may, however, be speculated that when experiencing paranoia, a vicious cycle forms that perpetuates both social withdrawal and a lack of trust in others. This is consistent with the feedback loop between social factors and the threat belief in Freeman et al. (2002)'s model of the maintenance of a persecutory delusion.

4.3.1. Other social connectedness variables

The Exploratory Data Analysis suggested other trends between social connectedness variables and objective trusting behaviour, including perceived emotional support and ability to interact with friends and complete social activities. These constructs may link with perceptions of emotional support. Individuals with psychosis may rate their level of emotional support as lower and subjective loneliness as higher than in the general population (Gayer-Anderson & Morgan, 2013), although this finding is not universal; some research suggests that individuals with psychosis do not report increased loneliness

perceptions. This form of social support can act as a buffer (Cohen, 2004) which is activated during periods of psychological stress. The pleasant nature of the virtual reality paradigm may not have triggered feelings of loneliness and emotional isolation in participants, meaning that existing levels of these traits did not impact on objective trust behaviour.

Given that previous research has found stronger links between paranoia and perceived emotional support than with the more practical social integration variables that showed statistical association (Sündermann et al., 2014; Turner & Brown, 2010), it is plausible that response bias or insufficient statistical power may have prevented any emerging effect from reaching significance.

4.4 Insecure attachment and trusting behaviour

Within the current study, individuals who described themselves as having an insecure attachment style displayed significantly lower levels of objective trusting behaviour towards the avatar than those with secure attachments.

Early adversity and loss are well-documented risk factors for psychosis (Varese et al., 2012), and attachment style is understood to explain the degree of adaptation made to these early difficulties due to the internal working models that an individual possesses (Gumley et al., 2014). Adult insecure attachment, associated with negative views of the self and others as well as maladaptive coping strategies for distress (Berry, Barrowclough, & Wearden, 2007), appears to show specific relation to symptoms of paranoia rather than other symptoms of psychosis (Bentall et al., 2014; Pickering et al., 2008). The present study found that a high proportion of individuals reported an insecure attachment style when compared to a comparable general population sample (Bartholomew & Horowitz, 1991). The findings of this study suggest that within individuals with clinical paranoia, an insecure attachment style can significantly impact on respondents' ability to show trusting behaviour for another individual in a tightly controlled, experimental setting.

Individuals with insecure attachment styles may experience difficulty engaging with others to seek help during distressing experiences such as experiencing symptoms of psychosis (Berry et al., 2008). Reduced help-seeking behaviour includes accessing both social networks and professional mental health service engagement (Gumley, Taylor, Schwannauer, & MacBeth, 2014). In the present study, insecurely attached individuals reported significantly less ability in interacting with other people, and had significantly lower levels of social capital. The sample size was not sufficient to investigate potential mediating and moderating mechanisms between these variables however it may of interest to complete further research that investigates this process more fully.

Insecurely attached individuals may also exhibit differences in Theory of Mind ability, due to an underdeveloped mentalising capacity based on early attachment relationships (Fonagy, Gergely, & Target, 2007; Fonagy & Target, 1997). Coupled with a negative view of other, this may lead to difficulty understanding the intentions of another person and resultant appraisals of threat which impacts on trusting behaviour and increases paranoid thoughts (Bentall et al., 2001).

Finally, insecurely attached individuals display higher levels of the negative symptoms of psychosis which include social withdrawal (Berry et al., 2008). This may act as a pathway to the formation of paranoid beliefs through perceptions that others are powerful and that threatening events are likely to occur in the future (Bentall & Fernyhough, 2008; Pickering et al., 2008).

4.5 Social connectedness, attachment and subjective trust

Counter to the study hypothesis, no significant relationships were noted between social connectedness variables and subjective trust, although Exploratory Data Analysis did suggest a tentative link with loneliness. Subjective trust, examined using an adapted version of the Trust in Close Relationships scale (Rempel et al., 1985), required respondents to

extrapolate several appraisals of the avatar shortly after their brief interaction. These scores may have been affected by strong and inflexible initial appraisals made of the avatar typically displayed in paranoia (Garety et al., 2001). Although all questionnaires were completed in the presence of the researchers, more emotionally salient measures such as loneliness may yield larger magnitudes of response bias from the young male participants, who might find it more difficult to engage in considering and sharing their emotions (Lecomte et al., 2008), resulting in distorted effects.

It is likewise plausible that individuals' attachment styles may have resulted in the conflicting associations of social connectedness between subjective trust and objective trusting behaviour. Insecure attachment styles are conceptualised by negative appraisals of the self, the other person, or both (Bartholomew & Horowitz, 1991). Dismissive attachment, prevalent in psychosis (Dozier et al., 1991) and the highest proportion of attachment style within the present study, is typified by a positive view of the self and negative view of the other. Within the previous study using non-clinical participants, dismissive attachment was associated with less objective trust however more subjective trust of the avatar, suggesting incongruous internal and external processes (Fornells-Ambrojo et al., 2016) typical of this attachment style may have manifest in the results of the study. Similar contradictory processes due to insecure attachment style may therefore be relevant within the present study's findings.

4.6 Symptoms variables and trust

Unlike the original study using non-clinical participants (Fornells-Ambrojo et al., 2016), no relationship was found in the study between the measure of paranoia or other symptoms of psychosis and objective trusting behaviour. This may be in part due to all participants in the current study having clinically significant levels of paranoia, rather than the spread of paranoia scores collected in the original study.

Positive symptoms of psychosis (CAPE) did, however show a negative relationship with subjective trust. This result was echoed in the analysis of the other researcher (GW), who found that strength of persecutory delusion was associated with objective trusting behaviour towards the avatar. Taken together, this finding may highlight the role of specific persecutory delusions in the process of appraising trust, rather than more general symptoms of paranoia on the paranoia continuum (Freeman et al., 2010; Johns & van Os, 2001).

4.7 Limitations

The findings of this study must be interpreted in the context of several limitations. Firstly, difficulties with recruitment meant that the final sample was substantially lower than the a priori estimates of the sample size that would be required to reach statistical power. Post hoc tests determined that sufficient power had been achieved with the study sample of 18 for some of the larger effect sizes reported, for example the majority of the associations between social connectedness variables and objective trusting behaviour. This was not, however, the case for possible associations including those between social connectedness and subjective trust. EDA was utilised to highlight potential trends in the data, but a considerably larger sample would have been needed to ascertain statistical significance with sufficient power. A conservative approach to data analyses was selected to minimise the likelihood of Type I error. Bonferroni corrections were applied to account for multiple testing and non-parametric testing selected because of the small sample size. However, this cautious approach could have resulted in an increase of Type II error in the context of the low statistical power of this study (Dienes, 2011).

Causal relationships between social connectedness and trust cannot be inferred from the study findings due to its correlational design. The hypothesised mechanisms linking these factors are, as discussed, complex and dynamic. The range of social connectedness variables examined, and their association with two measures of trust has

allowed for several different possible constructs within these variables to be explored. The fact that the associations were found between objective measures of social connectedness and trusting behaviour it considered to add to the robustness of the study findings. Additional characteristics within the sample, including ethnicity and employment status, were not however accounted for within these analyses. Ethnicity is linked to the risk of and prognosis of psychosis (Fearon et al., 2006; Morgan et al., 2006), including through the ethnic density effect (March et al., 2008; Veling et al., 2008), where higher rates of psychosis are observed in small ethnic minority populations than in larger populations. This association is suggested to interact with a lack of social support in the risk of psychosis (Eliacin, 2013). Further, social connectedness is found to moderate the level of risk and the duration of untreated psychosis in unemployed individuals (Morgan et al., 2014). There was not sufficient statistical power to investigate the potential interacting effects that these variables may have had on the links between social connectedness and trust in this clinical population.

Although all participants were above a threshold for clinical paranoia, they may not have represented a full range of levels of the symptom. Selection bias could be present as participants were willing and able to travel into Central London to complete the paradigm, which individuals with acute paranoia may not be have been able to achieve due to severe impairment and potential hospitalisation. Finally, the all-male participant group cannot be generalised to females with clinical paranoia, who may have interacted with and reacted differently to the male avatar due to gender-based differences.

4.8 Implications for future research and clinical practice

This is the first study known to directly examine how social connectedness factors may relate to trust and trusting behaviours using virtual reality in individuals with clinical paranoia. Replicating the research with a larger sample size, and thus greater statistical

power, would allow firmer conclusions to be drawn as well as an exploration of the role of potential interacting factors such as ethnicity and employment status. Given the intricate nature of proxemic processes (Hall et al., 1968), replication of the study with a female clinical population, a female avatar, or controlling for sexual orientation could allow specific differences to be noted between gender as well as the potential confound of sexual attraction. A research design including a comparison group of matched non-clinical individuals, or clinically diagnosed individuals without current paranoia, could elucidate further links between the role of social connectedness within paranoia and trust.

Other related variables are also of interest in future investigations. Research suggests that Theory of Mind impairment is linked to paranoia (Brüne, 2005; Frith, 2004; Lysaker et al., 2010). Given the current study's findings of associations between trust and both social functioning (which may link to social cognition), and insecure attachment (which is associated with poor Theory of Mind), future research may usefully focus on this variable. Negative social comparison has been found to influence levels of trust and paranoia in previous virtual reality settings (Freeman et al., 2014). Investigating the role of self-esteem in the relationship between paranoia and trust of avatar, and its links with social connectedness (Bentall, Kinderman, & Kaney, 1994), may allow for further understanding of these processes.

The virtual reality paradigm was designed to be a pleasant interaction, and the avatar to be an objectively friendly individual. Despite this, qualitative remarks suggested that several of the respondents perceived aspects of the situation to be suspicious, for example the point at which Mark receives a phone-call. Examining qualitative feedback has previously given valuable insight into participant experiences of virtual reality (Fornells-Ambrojo et al., 2015); therefore this analysis may yield a richer understanding of the underlying processes linking social connectedness, attachment and trust both in the present study and beyond. In particular, the respondents' reasoning for their ratings of subjective

trust of the avatar could be of interest, as this did not display quantitative associations with social connectedness variables.

The mixed appraisals of this objectively pleasant paradigm reported by this clinical population may also imply that had the scenario been more ambiguous, as is typical in other virtual reality scenarios (Freeman, Garety, Bebbington, Slater, et al., 2005; Valmaggia et al., 2007), different conclusions may have been raised. Future research could therefore extend upon this paradigm to develop new, more ambiguous interactive virtual reality scenarios.

Although the direction of the effect is unknown, the study findings allow tentative speculation that increasing levels of social connectedness may help individuals with paranoia to increase their levels of trust of others. Understanding the processes that may achieve this could help to guide and understand interventions. This may be achieved through encouraging regular social interaction through community participation to aid social integration and social norming behaviours, as well as social skills training to learn and reinforce knowledge of social cues (Newlin, Webber, Morris, & Howarth, 2015; Pilling et al., 2002). Treatments augmenting levels of social cognition may also allow greater flexibility in interpersonal appraisals made by individuals experiencing psychosis (Couture et al., 2006). Understanding and identifying safety behaviours and working with individuals to drop these could further aid interpersonal trust (Freeman et al., 2007). Taking into account attachment style when working therapeutically with an individual with paranoia may also be key to gaining both subjective and objective trust within the alliance (Lawlor, Hall, & Ellett, 2015).

Virtual reality is now being utilised not just to understand symptoms of psychosis, but also as a treatment tool. One such intervention encourages individuals with persecutory delusions to practise social connections in a virtual reality setting with non-verbal but interactive avatars. By rehearsing with the avatars the dropping of safety behaviours which would normally prevent social interaction, the intervention has resulted in reduced levels of distress and belief conviction (Freeman et al., 2016). Virtual reality interventions for other

mental health conditions such as social anxiety have also proven useful additions to treatment options (Klinger et al., 2005). The current interactive paradigm could be used in a similar manner. Given the potential that social norms and social cognition, as well as safety behaviours may influence trusting behaviour, the paradigm could be used in two ways. Firstly, individuals could practice a verbal interaction with the avatar in order to rehearse social engagement with a friendly other. Secondly, the paradigm could be used as a basis for social skills training in terms of experimenting with interpersonal distance and other non-verbal behaviours (Bellack et al., 2013) with a non-judgemental other. Future technological and conceptual development of virtual reality paradigms could build further on this potentially highly effective treatment model.

5. References

Adolphs, R. (2001). The neurobiology of social cognition. *Current opinion in neurobiology, 11*(2), 231-239.

Agid, O., Shapira, B., Zislin, J., Ritsner, M., Hanin, B., Murad, H., . . . Lerer, B. (1999). Environment and vulnerability to major psychiatric illness: a case control study of early parental loss in major depression, bipolar disorder and schizophrenia. *Molecular psychiatry, 4*(2), 163-172.

Allardyce, J., & Boydell, J. (2006). Environment and schizophrenia: review: The wider social environment and schizophrenia. *Schizophrenia Bulletin, 32*(4), 592-598.

Atherton, S., Antley, A., Evans, N., Cernis, E., Lister, R., Dunn, G., . . . Freeman, D. (2014). Self-Confidence and paranoia: an experimental study using an immersive virtual reality social situation. *Behav Cogn Psychother, 11*, 1-9.

Bailenson, J. N., Blascovich, J., Beall, A. C., & Loomis, J. M. (2003). Interpersonal distance in immersive virtual environments. *Personality and Social Psychology Bulletin, 29*(7), 819-833.

Bandura, A., & Walters, R. H. (1963). *Social learning and personality development* (Vol. 14): JSTOR.

Barker, C., Pistrang, N., & Elliot, R. (2002). *Research methods in clinical and counselling psychology*: John Wiley & Sons.

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition, 21*(1), 37-46.

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the Mind in the Eyes" Test revised version: a study with normal adults, and adults with Asperger syndrome or high-functioning autism. [Research Support, Non-U.S. Gov't Validation Studies]. *J Child Psychol Psychiatry, 42*(2), 241-251.

Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: a test of a four-category model. *Journal of personality and social psychology, 61*(2), 226.

Beels, C. C. (1981). Social support and schizophrenia. *Schizophr Bull, 7*(1), 58.

Behrens, J. T. (1997). Principles and procedures of exploratory data analysis. *Psychological Methods, 2*(2), 131.

Bellack, A. S., Mueser, K. T., Gingerich, S., & Agresta, J. (2013). *Social skills training for schizophrenia: A step-by-step guide*: Guilford Publications.

Bentall, R. P., Corcoran, R., Howard, R., Blackwood, N., & Kinderman, P. (2001). Persecutory delusions: a review and theoretical integration. *Clin Psychol Rev, 21*(8), 1143-1192.

Bentall, R. P., de Sousa, P., Varese, F., Wickham, S., Sitko, K., Haarmans, M., & Read, J. (2014). From adversity to psychosis: pathways and mechanisms from specific adversities to specific symptoms. *Social Psychiatry and Psychiatric Epidemiology, 49*(7), 1011-1022.

Bentall, R. P., & Fernyhough, C. (2008). Social predictors of psychotic experiences: specificity and psychological mechanisms. *Schizophrenia Bulletin, 34*(6), 1012-1020.

Bentall, R. P., Kinderman, P., & Kaney, S. (1994). The self, attributional processes and abnormal beliefs: Towards a model of persecutory delusions. *Behaviour research and therapy, 32*(3), 331-341.

Berkman, L. F., & Glass, T. (2000). Social integration, social networks, social support, and health. *Social epidemiology, 1*, 137-173.

Berry, K., Barrowclough, C., & Wearden, A. (2007). A review of the role of adult attachment style in psychosis: unexplored issues and questions for further research. [Review]. *Clin Psychol Rev, 27*(4), 458-475. doi: 10.1016/j.cpr.2006.09.006

Berry, K., Barrowclough, C., & Wearden, A. (2008). Attachment theory: a framework for understanding symptoms and interpersonal relationships in psychosis. [Multicenter

Study Research Support, Non-U.S. Gov't Validation Studies]. *Behav Res Ther, 46*(12), 1275-1282. doi: 10.1016/j.brat.2008.08.009

Bora, E., Yucel, M., & Pantelis, C. (2009). Theory of mind impairment in schizophrenia: meta-analysis. *Schizophr Res, 109*(1), 1-9.

Bourdeau, G., Lecomte, T., & Lysaker, P. H. (2015). Stages of recovery in early psychosis: Associations with symptoms, function, and narrative development. *Psychology and Psychotherapy: Theory, Research and Practice, 88*(2), 127-142.

Bourdieu, P. (2006). The forms of capital.(1986).

Bowlby, J. (1969). Attachment and loss, volume i: Attachment.

Brinkman, W.-P., Hartanto, D., Kang, N., de Vliegher, D., Kampmann, I. L., Morina, N., . . . Neerincx, M. (2012). *A virtual reality dialogue system for the treatment of social phobia*: ACM.

Brissette, I., Cohen, S., & Seeman, T. E. (2000). Measuring social integration and social networks. *Social support measurement and intervention: A guide for health and social scientists*, 53-85.

Brüne, M. (2005). "Theory of mind" in schizophrenia: a review of the literature. *Schizophr Bull, 31*(1), 21-42.

Claridge, G. E. (1997). *Schizotypy: Implications for illness and health*: Oxford University Press.

Cohen, J. (1992). A power primer. *Psychological bulletin, 112*(1), 155.

Cohen, S. (1988). Psychosocial models of the role of social support in the etiology of physical disease. *Health psychology, 7*(3), 269.

Cohen, S. (2004). Social relationships and health. *American psychologist, 59*(8), 676.

Combs, D. R., Finn, J. A., Wohlfahrt, W., Penn, D. L., & Basso, M. R. (2013). Social cognition and social functioning in nonclinical paranoia. *Cogn Neuropsychiatry, 18*(6), 531-548. doi: 10.1080/13546805.2013.766595

Corcoran, R. (2000). Theory of mind in other clinical conditions: Is a selective 'theory of mind' deficit exclusive to autism. *Understanding other minds: Perspectives from developmental cognitive neuroscience*, 391-421.

Couture, S. M., Penn, D. L., & Roberts, D. L. (2006). The functional significance of social cognition in schizophrenia: a review. [Research Support, Non-U.S. Gov't Review]. *Schizophr Bull, 32 Suppl 1*, S44-63. doi: 10.1093/schbul/sbl029

Cutting, J., & Murphy, D. (1990). Impaired ability of schizophrenics, relative to manics or depressives, to appreciate social knowledge about their culture. *The British Journal of Psychiatry, 157*(3), 355-358.

De Silva, M. J., McKenzie, K., Harpham, T., & Huttly, S. R. (2005). Social capital and mental illness: a systematic review. [Review]. *J Epidemiol Community Health, 59*(8), 619-627. doi: 10.1136/jech.2004.029678

Dienes, Z. (2011). Bayesian versus orthodox statistics: Which side are you on? *Perspectives on Psychological Science, 6*(3), 274-290.

Dozier, M., Stevenson, A. L., Lee, S. W., & Velligan, D. I. (1991). Attachment organization and familial overinvolvement for adults with serious psychopathological disorders. *Development and Psychopathology, 3*(04), 475-489.

Duke, M. P., & Mullens, C. (1973). Preferred interpersonal distance as a function of locus of control orientation in chronic schizophrenics, nonschizophrenic patients, and normals. *Journal of Consulting and Clinical Psychology, 41*(2), 230.

Dutt, K., & Webber, M. (2010). Access to social capital and social support among South East Asian women with severe mental health problems: a cross-sectional survey. *International Journal of Social Psychiatry, 56(6),* 593-605.

Elenbaas, M. (2013). *Paranoia and the Role of Contingency in the Experience of Trust and Perceived Empathy in Interpersonal Encounters.* D.Clin.Psy, University College London, London. (Volume 1)

Eliacin, J. (2013). Social Capital, Narratives of Fragmentation, and Schizophrenia: An Ethnographic Exploration of Factors Shaping African-Caribbeans' Social Capital and Mental Health in a North London Community. *Culture, Medicine, and Psychiatry, 37*(3), 465-487.

Faul, F., Erdfelder, E., Lang, A.G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175-191.

Fearon, P., Kirkbride, J. B., Morgan, C., Dazzan, P., Morgan, K., Lloyd, T., . . . Holloway, J. (2006). Incidence of schizophrenia and other psychoses in ethnic minority groups: results from the MRC AESOP Study. *Psychological Medicine, 36*(11), 1541-1550.

Felnhofer, A., Kothgassner, O. D., Beutl, L., Hlavacs, H., & Kryspin-Exner, I. (2012). Is virtual reality made for men only? Exploring gender differences in the sense of presence. *Proceedings of the International Society on Presence Research, Philadelphia, USA*.

Fenigstein, A., & Vanable, P. A. (1992). Paranoia and self-consciousness. *Journal of personality and social psychology, 62*(1), 129.

Fonagy, P., Gergely, G., & Target, M. (2007). The parent–infant dyad and the construction of the subjective self. *Journal of child psychology and psychiatry, 48*(3-4), 288-328.

Fonagy, P., & Target, M. (1997). Attachment and reflective function: Their role in self-organization. *Development and Psychopathology, 9*(04), 679-700.

Fornells-Ambrojo, M. (2007). Unpublished research.

Fornells-Ambrojo, M., Barker, C., Swapp, D., Slater, M., Antley, A., & Freeman, D. (2008b). Virtual reality and persecutory delusions: Safety and feasibility. *Schizophrenia Research, 104*(1-3), 228-236.

Fornells-Ambrojo, M., Elenbaas, M., Barker, C., Swapp, D., Navarro, X., Rovira, A., Sanahuja, T., & Slater, M. (2016). Hypersensitivity to Contingent Behavior in Paranoia: A New Virtual Reality Paradigm. *The Journal of nervous and mental disease, 204*(2), 148-152.

Fornells-Ambrojo, M., Freeman, D., Slater, M., Swapp, D., Antley, A., & Barker, C. (2015). How do people with persecutory delusions evaluate threat in a controlled social environment? A qualitative study using virtual reality. *Behavioural and cognitive psychotherapy, 43*(01), 89-107.

Freeman, D. (2007). Suspicious minds: the psychology of persecutory delusions. [Research Support, Non-U.S. Gov't Review]. *Clin Psychol Rev, 27*(4), 425-457. doi: 10.1016/j.cpr.2006.10.004

Freeman, D., Bradley, J., Antley, A., Bourke, E., DeWeever, N., Evans, N., & Dunn, G. (2016). Virtual reality in the treatment of persecutory delusions: randomised controlled experimental study testing how to reduce delusional conviction. *The British Journal of Psychiatry*, bjp. bp. 115.176438.

Freeman, D., Evans, N., Lister, R., Antley, A., Dunn, G., & Slater, M. (2014). Height, social comparison, and paranoia: an immersive virtual reality experimental study. *Psychiatry Research, 218*(3), 348-352.

Freeman, D., & Garety, P. A. (2000). Comments on the content of persecutory delusions: Does the definition need clarification? *British Journal of Clinical Psychology, 39*(4), 407-414.

Freeman, D., Garety, P. A., Bebbington, P., Slater, M., Kuipers, E., Fowler, D., & Dunn, G. (2005). The psychology of persecutory ideation II: a virtual reality experimental study. *The Journal of nervous and mental disease, 193*(5), 309-315.

Freeman, D., Garety, P. A., Bebbington, P. E., Smith, B., Rollinson, R., Fowler, D., & Dunn, G. (2005). Psychological investigation of the structure of paranoia in a non-clinical population. *The British Journal of Psychiatry, 186*(5), 427-435.

Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., & Bebbington, P. E. (2002). A cognitive model of persecutory delusions. *British Journal of Clinical Psychology, 41*(4), 331-347.

Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., Bebbington, P. E., & Dunn, G. (2007). Acting on persecutory delusions: the importance of safety seeking. *Behaviour Research and Therapy, 45*(1), 89-99.

Freeman, D., Pugh, K., Antley, A., Slater, M., Bebbington, P., Gittins, M., & Garety, P. (2008). Virtual reality study of paranoid thinking in the general population. *The British Journal of Psychiatry, 192*(4), 258-263.

Freeman, D., Pugh, K., Vorontsova, N., Antley, A., & Slater, M. (2010). Testing the Continuum of Delusional Beliefs: An Experimental Study Using Virtual Reality. *Journal of Abnormal Psychology, 119*(1), 83-92. doi: 10.1037/a0017514

Freeman, D., Slater, M., Bebbington, P. E., Garety, P. A., Kuipers, E., Fowler, D., & Vinayagamoorthy, V. (2003). Can virtual reality be used to investigate persecutory ideation? *The Journal of nervous and mental disease, 191*(8), 509-514.

Frith, C. D. (2004). Schizophrenia and theory of mind. *Psychol Med, 34*(03), 385-389.

Garety, P., Kuipers, E., Fowler, D., Freeman, D., & Bebbington, P. (2001). A cognitive model of the positive symptoms of psychosis. *Psychol Med, 31*(02), 189-195.

Gayer-Anderson, C., & Morgan, C. (2013). Social networks, support and early psychosis: a systematic review. *Epidemiology and psychiatric sciences, 22*(02), 131-146.

Green, C., Freeman, D., Kuipers, E., Bebbington, P., Fowler, D., Dunn, G., & Garety, P. (2008). Measuring ideas of persecution and social reference: the Green et al. Paranoid Thought Scales (GPTS). *Psychol Med, 38*(01), 101-111.

Griffin, D. W., & Bartholomew, K. (1994). Models of the self and other: Fundamental dimensions underlying measures of adult attachment. *Journal of personality and social psychology, 67*(3), 430.

Gumley, A., Taylor, H., Schwannauer, M., & MacBeth, A. (2014). A systematic review of attachment and psychosis: measurement, construct validity and outcomes. *Acta Psychiatrica Scandinavica, 129*(4), 257-274.

Gumley, A. I., Schwannauer, M., Macbeth, A., Fisher, R., Clark, S., Rattrie, L., . . . Birchwood, M. (2014). Insight, duration of untreated psychosis and attachment in first-episode psychosis: prospective study of psychiatric recovery over 12-month follow-up. *The British Journal of Psychiatry, 205*(1), 60-67. doi: 10.1192/bjp.bp.113.126722

Haddock, G., McCarron, J., Tarrier, N., & Faragher, E. (1999). Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). *Psychol Med, 29*(04), 879-889.

Hall, E. T., Birdwhistell, R. L., Bock, B., Bohannan, P., Diebold Jr, A. R., Durbin, M., . . . Kimball, S. T. (1968). Proxemics [and comments and replies]. *Current anthropology*, 83-108.

Hansen, C. F., Torgalsbøen, A.-K., Melle, I., & Bell, M. D. (2009). Passive/apathetic social withdrawal and active social avoidance in schizophrenia: difference in underlying psychological processes. *The Journal of nervous and mental disease, 197*(4), 274-277.

Hardy, A. Computerised Interventions for Thinking and Anxiety in Delusions (CITADEL) Trial (CITADEL) In: ClinicalTrials.gov [Internet]. NCT01920685.

Heimberg, R. G., Mueller, G. P., Holt, C. S., Hope, D. A., & Liebowitz, M. R. (1993). Assessment of anxiety in social interaction and being observed by others: The Social Interaction Anxiety Scale and the Social Phobia Scale. *Behavior Therapy, 23*(1), 53-73.

Horan, W. P., Subotnik, K. L., Snyder, K. S., & Nuechterlein, K. H. (2006). Do recent-onset schizophrenia patients experience a "social network crisis"? *Psychiatry, 69*(2), 115-129.

House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *Annual review of sociology*, 293-318.

Johns, L. (2005). Hallucinations in the general population. *Current Psychiatry Reports, 7*(3), 162-167. doi: 10.1007/s11920-005-0049-9

Johns, L., & van Os, J. (2001). The continuity of psychotic experiences in the general population. [Review]. *Clin Psychol Rev, 21*(8), 1125-1141.

Kirkpatrick, B., Fenton, W. S., Carpenter, W. T., & Marder, S. R. (2006). The NIMH-MATRICS consensus statement on negative symptoms. *Schizophrenia Bulletin, 32*(2), 214-219.

Klinger, E., Bouchard, S., Légeron, P., Roy, S., Lauer, F., Chemin, I., & Nugues, P. (2005). Virtual reality therapy versus cognitive behavior therapy for social phobia: A preliminary controlled study. *CyberPsychology & Behavior, 8*(1), 76-88.

Konings, M., Bak, M., Hanssen, M., Van Os, J., & Krabbendam, L. (2006). Validity and reliability of the CAPE: A self-report instrument for the measurement of psychotic experiences in the general population. *Acta Psychiatrica Scandinavica, 114*(1), 55-61.

Kurtz, M. M., & Mueser, K. T. (2008). A meta-analysis of controlled research on social skills training for schizophrenia. *Journal of Consulting and Clinical Psychology, 76*(3), 491.

Langdon, R., Still, M., Connors, M. H., Ward, P. B., & Catts, S. V. (2013). Attributional biases, paranoia, and depression in early psychosis. *British Journal of Clinical Psychology, 52*(4), 408-423. doi: 10.1111/bjc.12026

Lawlor, C., Hall, K., & Ellett, L. (2015). Paranoia in the therapeutic relationship in cognitive behavioural therapy for psychosis. *Behavioural and cognitive psychotherapy, 43*(04), 490-501.

Lecomte, T., Corbière, M., Ehmann, T., Addington, J., Abdel-Baki, A., & MacEwan, B. (2014). Development and preliminary validation of the First Episode Social Functioning Scale for early psychosis. *Psychiatry Research, 216*(3), 412-417.

Lecomte, T., Spidel, A., Leclerc, C., MacEwan, G. W., Greaves, C., & Bentall, R. P. (2008). Predictors and profiles of treatment non-adherence and engagement in services problems in early psychosis. *Schizophrenia Research, 102*(1–3), 295-302. doi: http://dx.doi.org/10.1016/j.schres.2008.01.024

Lysaker, P. H., Salvatore, G., Grant, M. L., Procacci, M., Olesek, K. L., Buck, K. D., . . . Dimaggio, G. (2010). Deficits in theory of mind and social anxiety as independent paths to paranoid features in schizophrenia. *Schizophr Res, 124*(1), 81-85.

Macdonald, E., Hayes, R., & Baglioni Jr, A. (2000). The quantity and quality of the social networks of young people with early psychosis compared with closely matched controls. *Schizophr Res, 46*(1), 25-30.

March, D., Hatch, S. L., Morgan, C., Kirkbride, J. B., Bresnahan, M., Fearon, P., & Susser, E. (2008). Psychosis and place. *Epidemiologic Reviews, 30*(1), 84-100.

Meins, E., Jones, S. R., Fernyhough, C., Hurndall, S., & Koronis, P. (2008). Attachment dimensions and schizotypy in a non-clinical sample. *Personality and Individual Differences, 44*(4), 1000-1011.

Morgan, C., Dazzan, P., Morgan, K., Jones, P., Harrison, G., Leff, J., . . . Fearon, P. (2006). First episode psychosis and ethnicity: initial findings from the AESOP study. *World Psychiatry, 5*(1), 40-46.

Morrison, A. P. (2001). The interpretation of intrusions in psychosis: an integrative cognitive approach to hallucinations and delusions. *Behavioural and Cognitive Psychotherapy, 29*, 257-276.

Mossaheb, N., Becker, J., Schaefer, M. R., Klier, C. M., Schloegelhofer, M., Papageorgiou, K., & Amminger, G. P. (2012). The Community Assessment of Psychic Experience (CAPE) questionnaire as a screening-instrument in the detection of individuals at ultra-high risk for psychosis. *Schizophrenia Research, 141*(2–3), 210-214. doi: http://dx.doi.org/10.1016/j.schres.2012.08.008

Mueser, K. T. E., & Tarrier, N. E. (1998). *Handbook of social functioning in schizophrenia*: Allyn & Bacon.
Nechamkin, Y., Salganik, I., Modai, I., & Ponizovsky, A. M. (2003). Interpersonal distance in schizophrenic patients: relationship to negative syndrome. *International Journal of Social Psychiatry, 49*(3), 166-174.
Neeleman, J., & Power, M. (1994). Social support and depression in thre e groups of psychiatric patients and a group of medical controls. *Social Psychiatry and Psychiatric Epidemiology, 29*(1), 46-51.
Newlin, M., Webber, M., Morris, D., & Howarth, S. (2015). Social participation interventions for adults with mental health problems: A review and narrative synthesis. *Social Work Research, 39*(3), 167-180.
Norman, R. M., Malla, A. K., Manchanda, R., Harricharan, R., Takhar, J., & Northcott, S. (2005). Social support and three-year symptom and admission outcomes for first episode psychosis. *Schizophr Res, 80*(2), 227-234.
Palumbo, C., Volpe, U., Matanov, A., Priebe, S., & Giacco, D. (2015). Social networks of patients with psychosis: a systematic review. *BMC research notes, 8*(1), 560.
Park, S.-H., Ku, J., Kim, J.-J., Jang, H. J., Kim, S. Y., Kim, S. H., . . . Kim, S. I. (2009). Increased personal space of patients with schizophrenia in a virtual social environment. *Psychiatry Research, 169*(3), 197-202.
Penn, D. L., Kohlmaier, J. R., & Corrigan, P. W. (2000). Interpersonal factors contributing to the stigma of schizophrenia: social skills, perceived attractiveness, and symptoms. *Schizophrenia Research, 45*(1), 37-45.
Peters, E. R., Joseph, S. A., & Garety, P. A. (1999). Measurement of delusional ideation in the normal population: introducing the PDI (Peters et al. Delusions Inventory). *Schizophr Bull, 25*(3), 553-576.
Pickering, L., Simpson, J., & Bentall, R. P. (2008). Insecure attachment predicts proneness to paranoia but not hallucinations. *Personality and Individual Differences, 44*(5), 1212-1224.
Pilling, S., Bebbington, P., Kuipers, E., Garety, P., Geddes, J., Martindale, B., . . . Morgan, C. (2002). Psychological treatments in schizophrenia: II. Meta-analyses of randomized controlled trials of social skills training and cognitive remediation. *Psychological Medicine, 32*(05), 783-791.
Power, M., Champion, L., & Aris, S. (1988). The development of a measure of social support: the Significant Others (SOS) Scale. *British Journal of Clinical Psychology, 27*(4), 349-358.
Pruessner, M., Iyer, S. N., Faridi, K., Joober, R., & Malla, A. K. (2011). Stress and protective factors in individuals at ultra-high risk for psychosis, first episode psychosis and healthy controls. *Schizophr Res, 129*(1), 29-35.
Randall, F., Corcoran, R., Day, J., & Bentall, R. (2003). Attention, theory of mind, and causal attributions in people with persecutory delusions: a preliminary investigation. *Cogn Neuropsychiatry, 8*(4), 287-294.
Read, & Gumley, A. (2008). Can attachment theory help explain the relationship between childhood adversity and psychosis? *Attachment: New Directions in Psychotherapy and Relational Psychoanalysis, 2*(1), 1-35.
Read, J., van Os, J., Morrison, A. P., & Ross, C. A. (2005). Childhood trauma, psychosis and schizophrenia: a literature review with theoretical and clinical implications. [Review]. *Acta Psychiatr Scand, 112*(5), 330-350. doi: 10.1111/j.1600-0447.2005.00634.x
Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of personality and social psychology, 49*(1), 95.
Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of personality assessment, 66*(1), 20-40.

Sartorius, N., Jablensky, A., Korten, A., Ernberg, G., Anker, M., Cooper, J. E., & Day, R. (1986). Early manifestations and first-contact incidence of schizophrenia in different cultures: a preliminary report on the initial evaluation phase of the WHO Collaborative Study on determinants of outcome of severe mental disorders. *Psychol Med, 16*(04), 909-928.

Schneider, J., Arthur, A., Doody, G., Simpson, J., & Jones, P. (2009). Individual social capital and psychosis: secondary analysis of AESOP data for Nottingham. *Mental Health Review Journal, 14*(3), 4-12.

Schoretsanitis, G., Kutynia, A., Stegmayer, K., Strik, W., & Walther, S. (2016). Keep at bay!–Abnormal personal space regulation as marker of paranoia in schizophrenia. *European Psychiatry, 31*, 1-7.

Selten, J.-P., van der Ven, E., Rutten, B. P., & Cantor-Graae, E. (2013). The social defeat hypothesis of schizophrenia: an update. *Schizophrenia Bulletin, 39*(6), 1180-1186.

Slater, M., McCarthy, J., & Maringelli, F. (1998). The influence of body movement on subjective presence in virtual environments. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 40*(3), 469-477.

Song, Y. Y., Kim, K. R., Park, J. Y., Lee, S. Y., Kang, J. I., Lee, E., . . . Kwon, J. S. (2011). Associated factors of quality of life in first-episode schizophrenia patients. *Psychiatry investigation, 8*(3), 201-206.

Strauss. (1969). Hallucinations and delusions as points on continua function. . *Arch. Gen. Psychiatry, 21*, 581-586.

Sündermann, O., Onwumere, J., Kane, F., Morgan, C., & Kuipers, E. (2014). Social networks and support in first-episode psychosis: exploring the role of loneliness and anxiety. *Social psychiatry and psychiatric epidemiology, 49*(3), 359-366.

Tempier, R., Balbuena, L., Garety, P., & Craig, T. J. (2012). Does Assertive Community Outreach Improve Social Support? Results From the Lambeth Study of Early-Episode Psychosis. *Psychiatric Services, 63*(3), 216-222. doi: doi:10.1176/appi.ps.20110013

Tempier, R., Balbuena, L., Lepnurm, M., & Craig, T. K. (2013). Perceived emotional support in remission: results from an 18-month follow-up of patients with early episode psychosis. *Social Psychiatry and Psychiatric Epidemiology, 48*(12), 1897-1904.

Thewissen, V., Bentall, R. P., Lecomte, T., van Os, J., & Myin-Germeys, I. (2008). Fluctuations in self-esteem and paranoia in the context of daily life. *Journal of Abnormal Psychology, 117*(1), 143.

Tukey, J. W. (1977). Exploratory data analysis.

Turner, R. J., & Brown, R. L. (2010). Social support and mental health.

Valmaggia, L. R., Day, F., Garety, P., Freeman, D., Antley, A., Slater, M., . . . McGuire, P. (2015). Social defeat predicts paranoid appraisals in people at high risk for psychosis. *Schizophrenia Research, 168*(1), 16-22.

Valmaggia, L. R., Freeman, D., Green, C., Garety, P., Swapp, D., Antley, A., . . . Bebbington, P. (2007). Virtual reality and paranoid ideations in people with an 'at-risk mental state' for psychosis. *The British Journal of Psychiatry, 191*(51), s63-s68.

van Os, J., & Verdoux, H. (2003). Diagnosis and classification of schizophrenia: categories versus dimensions, distributions versus disease. *The epidemiology of schizophrenia*, 364-410.

Varese, F., Smeets, F., Drukker, M., Lieverse, R., Lataster, T., Viechtbauer, W., . . . Bentall, R. P. (2012). Childhood adversities increase the risk of psychosis: a meta-analysis of patient-control, prospective- and cross-sectional cohort studies. [Meta-Analysis Research Support, Non-U.S. Gov't Review]. *Schizophr Bull, 38*(4), 661-671. doi: 10.1093/schbul/sbs050

Veling, W., Brinkman, W.-P., Dorrestijn, E., & Van Der Gaag, M. (2014). Virtual reality experiments linking social environment and psychosis: a pilot study. *Cyberpsychology, Behavior, and Social Networking, 17*(3), 191-195.
Veling, W., Susser, E., Jim van Os, M., Mackenbach, J. P., Selten, J.-P., & Hoek, H. W. (2008). Ethnic density of neighborhoods and incidence of psychotic disorders among immigrants. *American journal of Psychiatry*.
Verdoux, H., & van Os, J. (2002). Psychotic symptoms in non-clinical populations and the continuum of psychosis. [Festschrift]. *Schizophr Res, 54*(1-2), 59-65.
Wagman, A. (1988). Deficit and nondeficit forms of schizophrenia: the concept. Am J Psychiatry, 145, 578-583.
Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of personality and social psychology, 54*(6), 1063.
Webber, M., & Huxley, P. (2007). Measuring access to social capital: The validity and reliability of the Resource Generator-UK and its association with common mental disorder. *Social science & medicine, 65*(3), 481-492. doi: http://dx.doi.org/10.1016/j.socscimed.2007.03.030
Webber, M., Huxley, P., & Harris, T. (2011). Social capital and the course of depression: six-month prospective cohort study. *Journal of affective disorders, 129*(1), 149-157.
Wells, A., Clark, D. M., Salkovskis, P., Ludgate, J., Hackmann, A., & Gelder, M. (1996). Social phobia: The role of in-situation safety behaviors in maintaining anxiety and negative beliefs. *Behavior Therapy, 26*(1), 153-161.
Wessely, S., Buchanan, A., Reed, A., Cutting, J., Everitt, B., Garety, P., & Taylor, P. (1993). Acting on delusions. I: Prevalence. *The British Journal of Psychiatry, 163*(1), 69-76.
Wilson, C., Smith, M. E., Thompson, E., Demro, C., Kline, E., Bussell, K., . . . Schiffman, J. (2016). Context matters: The impact of neighborhood crime and paranoid symptoms on psychosis risk assessment. *Schizophrenia Research*.
Woody, S. R. (1996). Effects of focus of attention on anxiety levels and social performance of individuals with social phobia. *Journal of Abnormal Psychology, 105*(1), 61.
World Health Organization. (1993). The ICD-10 classification of mental and behavioural disorders: diagnostic criteria for research.
Yee, N., Bailenson, J. N., Urbanek, M., Chang, F., & Merget, D. (2007). The unbearable likeness of being digital: The persistence of nonverbal social norms in online virtual environments. *CyberPsychology & Behavior, 10*(1), 115-121.

Part 3: Critical Appraisal

1. Introduction

This appraisal aims to provide thoughts and personal reflections on the research processes involved in completing this thesis. In particular, it focusses on four key areas. The challenges of recruitment for a study involving participants from a 'hard to reach population' within a set time period will be discussed. The unexpected positive effects reported by participants of taking part in the study are noted. The implications of the relatively small sample sizes of the meta-analysis and empirical paper, and the analysis that was conducted as a result of this will be reflected upon. From this, thoughts on how small sample data can be utilised and analysed effectively and meaningfully will be considered. Finally, the use of virtual reality technology, both for research purposes and for wider clinical applications, will be evaluated.

2. Recruiting participants with clinical paranoia

The empirical paper component of this thesis investigated how social factors were related to an individual's levels of trust of the virtual reality avatar, within a population of male individuals with clinical paranoia. The chance to research this clinical population was a large factor in my interest in this topic, due to my previous training and research experiences working with early psychosis. Past research, however, has documented difficulties in researching this population (Freeman, 2007), due to the anxiety and suspiciousness inherent in the condition.

2.1 Gaining ethical approval

In order to gain access to this sample population, NHS ethics had to be completed. This allowed the researchers to recruit directly from NHS services where there would be a high incidence rate of the target population. The decision was taken at the research planning phase to gain ethical approval specifically for Early Intervention for Psychosis Teams (EIPTs) from several London boroughs, with the rationale that these services would

contain many individuals with First Episode Psychosis and likely paranoia. Understanding early psychosis is thought to have useful implications for intervention that may improve long-term outcomes of the condition (Lieberman et al., 2001; Norman & Malla, 2001). Specifically within the realms of social factors, evidence suggests (as cited in the literature review component of this thesis) that as the length of psychosis increases, social support and social networks decrease (Gayer-Anderson & Morgan, 2013; Kauranen, Seikkula, & Alakare, 2000; Norman, 2014). Recruiting from a First Episode Psychosis population was therefore deemed to be a way of attempting to control for these variables.

One difficulty in recruitment came during the research governance process. This was a very lengthy task, where delays were encountered at each stage; from the initial university-led Joint Research Office checks, the NHS National Research Ethics Service panel and amendments, to finally the separate Research and Development (R&D) processes for the boroughs within which each EIPT service was situated within. From start to finish, this process took approximately fifteen months (initial ethics forms were completed in November 2014, and the R&D approval for the final borough was not granted until February 2016. Before R&D approval had been given, researchers were not permitted to attend team meetings to discuss the project with Care Coordinators. This meant that no recruitment could be completed for over half of the time-span of the thesis.

2.2 Accessing clients

Once access to the EIPTs was permitted, it was at times challenging to gain access to suitable clients. The protocol for recruiting participants involved asking a client's Care Coordinator to approach them and gain permission for us to contact them about the study. This was a necessary step, as the nature of the sample meant that having an unknown person approaching them regarding research could be quite a stressful or anxiety-provoking situation and thus to be avoided. Requiring Care Coordinators to gain permission for us to

speak to potential participants, however, also caused delays in some cases. The teams at the EIPTs were extremely busy and research may not be top priority whilst they were managing high-risk caseloads. The Care Coordinators' role of 'gate-keeper' therefore sometimes meant that although there were suitable clients available, the researchers were unable to contact these individuals. In total, 27 clients identified as potential participants were not successfully contacted by their Care Coordinators; this comprised over a third of the total potential referrals.

2.3 From screening to participation

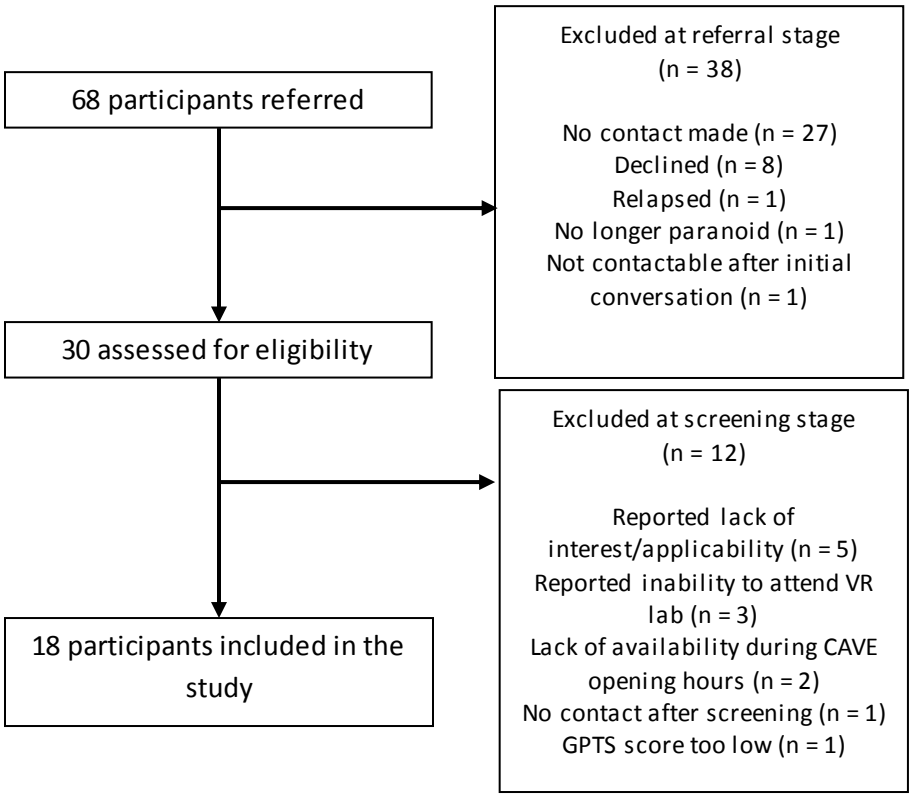
Once the researchers were able to contact potential participants, the nature of their paranoid thinking did impact further on how successful recruitment was. Some participants were suspicious of picking up the phone to people or to numbers that they did not know, whilst others were initially not happy to meet with us as relative strangers. The idea of virtual reality research was not attractive to some individuals, and the applicability of the research to them was also sometimes questioned (n = 5). This may partially have been due to lack of insight into their current condition. Others (n = 3) felt unable to travel into the centre of London to complete the experiment. Scores on the screening measures and symptoms measures suggested a range of severity in paranoia; however it may be that those with very high levels of the trait were not included within the study due to these issues. Discussing cases with Care Coordinators at times elicited responses such as "He won't be able to make it; he will not leave the house", which may have impacted on the likelihood that these clients were approached. This may impact on the generalisability of the study findings to individuals with extremely severe levels of persecutory delusion.

As researchers, we were very flexible to try and accommodate these worries: offering to meet people near to their houses or at tube stops to travel to the experiment

setting with them, arranging taxis if public transport was a stressor, and arranging extended pre-study conversations either over the phone or face to face where necessary.

The conversion rate of referral to participation was 26.5%. This is comparable to the only other published research using virtual reality research and persecutory delusions, where 25% of those referred participated (Freeman et al., 2016). In the current study, only one participant agreed to meet but then did not attend the experiment setting to complete the study. Please see Figure 1 for a detailed analysis of participant recruitment.

Figure 1: Participant recruitment flowchart



The final variable in recruitment was availability of the Computer Aided Virtual Environment (CAVE), where the virtual reality aspect of the project was situated. This is a state of the art facility and as such is in demand from many departments of the host university, meaning that there was at times a restricted timetable available to us. If a participant was recruited, their availability and the CAVE availability needed to be

coordinated. There were occasions where the two could not be combined and n=2 participants were lost from the study as a result.

Given the extremely small sample size, the risk of losing a participant due to technical difficulties was judged to be of serious concern. This therefore meant that the scenario was loaded and 3 dimensional qualities tested before the interpersonal interaction with the avatar began. Although this resulted in a complete dataset, it also meant that the participant saw the avatar for a few seconds before the scenario began. It is possible that this initial impression may have impacted on their overall behaviour within, and impressions of, the paradigm.

With all of these confounding factors in mind, it can be concluded that the time period that was available for recruitment was too short and thus that the research submitted for the thesis deadline had a relatively low sample size. Towards the end of recruitment, frequency of referral from EIPTs increased, and the CAVE had better availability, meaning that sample size increased substantially. Future studies that need to compete with these factors may require longer time frames, or a more concentrated effort at the front end of the recruitment drive to elicit a higher initial rate of referrals from Care Coordinators. The relatively small sample size was a major limiting factor into the generalisability of the study findings.

3. Secondary outcomes from the study

Feedback after the study from participants was overwhelmingly positive, with many participants reporting that they would like to complete the study again. All but one participant stated that they would like to receive an accessible copy of the results, which suggests that engagement and interest levels were high.

Several participants and Care Coordinators noted positive secondary outcomes from participating in the research. Research suggests that males with early psychosis have lower

levels of service engagement than other groups due to factors such as mistrust of authority and a poor therapeutic alliance (Lecomte et al., 2008). The scope of the questionnaires and debrief scaffolded participants to mention difficulties with social isolation and relationships, as well as anxieties around the symptoms that they experienced. A number of participants noted that they would not normally have spoken about these factors, however felt comfortable to do so within the study setting. This information was dealt with sensitively, and with permission fed back to the individual's Care Coordinator. Several comments by both participants and mental health professionals informed the researchers that this opportunity to speak and be listened to had felt positive to the participant.

One participant felt able to leave a pet unattended that he had previously been too anxious to leave the house without, conduct which could be conceptualised as a safety behaviour that was perpetuating their paranoid beliefs (Freeman, 2007). By providing support around this, the researchers were able to help this individual to spend time without the animal, and assist in communicating this development with his mental health team who subsequently were able to link the participant with available community services to help reduce social isolation.

Some participants also found the university, and particularly the laboratory setting, of the study to be an environment that sparked their interest in academia and further education. This provided these individuals with inspiration to look into educational courses that they had previously either dropped out from, or had not felt confident to pursue an interest in. Again, with participants' permission, the researchers relayed this information to Care Coordinators to allow potential educational opportunities to be discussed.

4. Analysis of results from a small sample size

Both the meta-analysis and the empirical paper components of this thesis used datasets of a relatively small sample size (k = 7 studies in the literature review and n = 18

participants in the empirical study). This fact was identified and noted as a major limitation in the discussion sections of both papers.

The decision to proceed with a meta-analysis with a relatively small number of studies stemmed from wish to highlight tangible links between social connectedness and course of psychosis. Although meta-analytic techniques can validly be performed with very small numbers of studies (Borenstein, Hedges, Higgins, & Rothstein, 2009), the heterogeneity of the variables utilised in the included studies of the current meta-analysis meant that conclusions drawn may be limited.

This high-lighted for me a pervasive difficulty within the study into social factors of mental health that, although based in the research world, has ramifications at a clinical and service-delivery level. Despite the fact that many researchers record social variables within empirically sound paradigms; these are often not perceived as key measures, or sometimes reported on at all within their papers. There is therefore potentially a lack of literature that empirically examines and understands the impact that social factors may have on the course of mental health difficulties such as psychosis. This renders it difficult for social interventions to be included within recommended evidence-based treatment manuals, meaning that funding may not be as readily available for these interventions and initiatives to continue. I feel that the current meta-analysis therefore allowed this gap in research to be high-lighted.

Within the empirical paper, the comprehensive number of measures taken and data collected meant that tentative yet meaningful conclusions could be drawn from this thesis research. The correlational nature of the empirical paper's analyses meant, however, that no testing that could infer causality could be conducted. Additionally, larger numbers would have enabled parametric statistical analyses with higher power to be completed, but the low sample recruited necessitated non-parametric and non-statistical techniques.

Exploratory Data Analysis (EDA) employs a differing philosophy from statistical tests (Tukey, 1977), in that it analyses the data in creative ways to elucidate patterns and trends that may not be immediately visible within the raw data. Tukey likens the process to 'detective work', involving 'listening to the data' to find a plausible story, even if this story would not apply to subsequent participant samples. This is different to statistical or confirmatory data analysis (CDA), which seeks to prove a pre-existing point. These two approaches can sometimes be seen by researchers to be in contrast to one another; using a 'court-trial' analogy, EDA works as the detective formulating the case whereas CDA acts as the harsh prosecutor (Behrens, 1997). Another way of viewing these theoretical standpoints, however, is working in conjunction with one another. In this way, EDA forms the hypothesis building, inductive part of analysis, which CDA then seeks to prove or disprove, and if possible, generalise. Increasingly, arguments are being made for employing a well thought through Bayesian approach to research rather than decisively proving or disproving a theory, especially within fields such as psychology (Dienes, 2011) where many factors may impact on a research finding and ruthless statistical testing may in fact be a less valid manner of treating data.

The analyses conducted on the data from this study therefore utilised both EDA and CDA approaches to enable an understanding of patterns and trends within the data, as well as simply exploring statistical associations. I feel that this style of analysis made the best use of the small sample size and allowed the trends in the data to be identified that may have otherwise been missed due to low statistical power. A challenge was balancing the two approaches to ensure that conclusions were neither too tentative nor too assumptive. This balance is crucial, and has enabled recommendations for future research to be formed in a manner that would have not occurred if solely statistical analysis had been utilised.

5. Interactive virtual reality research with a clinical population

This research was the first known to utilise a virtual reality scenario involving a verbal discussion with participants experiencing clinical paranoia. Within the paradigm, the participant has an objectively pleasant interpersonal encounter with an individual virtual reality avatar. Historically, virtual reality research into paranoia and persecutory delusions has utilised neutral or ambiguous situations with several avatars to elicit paranoid ideations in participants. Previously utilised scenarios include a London underground train (Fornells-Ambrojo et al., 2008; Freeman et al., 2008; Valmaggia et al., 2007) and a library scene (Freeman et al., 2005). These situations have high ecological validity, however the potential to interact with the scenario is limited; participants were normally only able to look at or to smile at the avatars within the scene. The majority of the research has also utilised non-clinical populations, with some exceptions (Fornells-Ambrojo et al., 2008; Freeman, Pugh, Vorontsova, Antley, & Slater, 2010).

Given that paranoia is intrinsically linked with interpersonal concerns, learning more about how a clinical population interacted with and appraised an avatar seemed an extremely relevant development to the field. In this way, a specific interest that I hold in the role of social connectedness and social isolation in severe mental health difficulties could also be investigated further. The opportunity to use the innovative paradigm with this client group was therefore something that attracted me greatly to the project.

An additional advantage of this, and other, virtual reality paradigms was the ability to examine both subjective and objective variables. The disparity in the findings between the subjective and objective measures of trust utilised in this study suggests that differing mechanisms may lie behind them. The links between self-rated levels of social connectedness and the objective behavioural measure of trust in particular fascinated me, and is something that future research may be able to expand upon.

The novel nature of the paradigm and the potentially challenging client group did provide some challenges for the researchers. The scenario utilised was developed for previous research into non-clinical levels of paranoia (Fornells-Ambrojo et al., 2016) and utilised by a previous Clinical Psychology Doctoral student (Elenbaas, 2014). Technical support was given by the head of the virtual reality laboratory. The current study virtual scenario was therefore well-supported and had been tested for issues during the previous study. The pre-existence of the scenario also meant that there was no scope for alterations or fine-tuning, despite the fact that since its creation, new virtual reality technology had emerged. Participant feedback of the experience suggested that although the avatar moved and acted naturally and realistically, the quality of the scenario graphics could have been improved to augment their sense of immersion in the environment (more of this information is available in the joint researcher, GW's, thesis). Given that the sample population were young men with access to high-quality computer and video games, it is perhaps unsurprising that these comments were relatively common within the study participants. Taking the comments of these well-informed participants forward in designing new scenarios will help to improve future paradigms.

Virtual reality has been used successfully in the treatment of auditory hallucinations in the form of avatar therapy (Leff, Williams, Huckvale, Arbuthnot, & Leff, 2014), with participants showing lower levels of belief conviction, perceived power of hallucination, and distress. An initial study of utilising virtual reality cognitive therapy to help individuals with persecutory delusions to drop safety behaviours that may be perpetuating their beliefs also showed marked improvements in belief conviction and levels of real-world distress (Freeman et al., 2016). It is my hope that this type of interactive virtual reality paradigm could be developed and utilised as a way of treating persecutory delusions and paranoia in the future.

6. Conclusions

Despite severe difficulties in recruitment, the present empirical study allowed associations of social connectedness and trust of another individual to be examined in an experimental and controlled manner, within participants who experience clinical paranoia. The experience of using virtual reality technology to elicit the real-time responses of this participant group has been a very valuable and rewarding one. The meta-analysis further allowed mathematical links to be tentatively discussed between social connectedness and later outcome in the course of psychosis. I believe that utilising these sorts of research techniques with variables such social connectedness has an important place in the advancement of our understanding of paranoia and psychosis, as well as the crucial but poorly understood links that social withdrawal plays in their aetiology and maintenance.

7. References

Behrens, J. T. (1997). Principles and procedures of exploratory data analysis. *Psychological Methods, 2*(2), 131.

Borenstein, M., Hedges, L. V., Higgins, J., & Rothstein, H. R. (2009). *Front matter*: Wiley Online Library.

Dienes, Z. (2011). Bayesian versus orthodox statistics: Which side are you on? *Perspectives on Psychological Science, 6*(3), 274-290.

Elenbaas, M. (2014). *Paranoia and the Role of Contingency in the Experience of Trust and Perceived Empathy in Interpersonal Encounters.* Unpublished Doctoral Thesis, University College London, London.

Fornells-Ambrojo, M., Barker, C., Swapp, D., Slater, M., Antley, A., & Freeman, D. (2008). Virtual reality and persecutory delusions: Safety and feasibility. *Schizophr Res, 104*(1), 228-236.

Fornells-Ambrojo, M., Elenbaas, M., Barker, C., Swapp, D., Navarro, X., Rovira, A., & Slater, M. (2016). Hypersensitivity to Contingent Behavior in Paranoia: A New Virtual Reality Paradigm. *The Journal of nervous and mental disease, 204*(2), 148-152.

Freeman, D. (2007). Suspicious minds: the psychology of persecutory delusions. [Research Support, Non-U.S. Gov't Review]. *Clin Psychol Rev, 27*(4), 425-457. doi: 10.1016/j.cpr.2006.10.004

Freeman, D., Bradley, J., Antley, A., Bourke, E., DeWeever, N., Evans, N., & Dunn, G. (2016). Virtual reality in the treatment of persecutory delusions: randomised controlled experimental study testing how to reduce delusional conviction. *The British Journal of Psychiatry*, bjp. bp. 115.176438.

Freeman, D., Garety, P. A., Bebbington, P., Slater, M., Kuipers, E., Fowler, D., & Dunn, G. (2005). The psychology of persecutory ideation II: a virtual reality experimental study. *The Journal of nervous and mental disease, 193*(5), 309-315.

Freeman, D., Pugh, K., Antley, A., Slater, M., Bebbington, P., Gittins, M., .& Garety, P. (2008). Virtual reality study of paranoid thinking in the general population. *The British Journal of Psychiatry, 192*(4), 258-263.

Freeman, D., Pugh, K., Vorontsova, N., Antley, A., & Slater, M. (2010). Testing the Continuum of Delusional Beliefs: An Experimental Study Using Virtual Reality. *Journal of Abnormal Psychology, 119*(1), 83-92. doi: 10.1037/a0017514

Gayer-Anderson, C., & Morgan, C. (2013). Social networks, support and early psychosis: a systematic review. *Epidemiology and psychiatric sciences, 22*(02), 131-146.

Kauranen, A., Seikkula, J., & Alakare, B. (2000). The change of social network of first episode psychotic patients in a network oriented treatment. *Psykologia, 35*(5), 403-415.

Lecomte, T., Spidel, A., Leclerc, C., MacEwan, G. W., Greaves, C., & Bentall, R. P. (2008). Predictors and profiles of treatment non-adherence and engagement in services problems in early psychosis. *Schizophrenia Research, 102*(1–3), 295-302. doi: http://dx.doi.org/10.1016/j.schres.2008.01.024

Leff, J., Williams, G., Huckvale, M., Arbuthnot, M., & Leff, A. P. (2014). Avatar therapy for persecutory auditory hallucinations: what is it and how does it work? *Psychosis, 6*(2), 166-176.

Lieberman, J. A., Perkins, D., Belger, A., Chakos, M., Jarskog, F., Boteva, K., & Gilmore, J. (2001). The early stages of schizophrenia: speculations on pathogenesis, pathophysiology, and therapeutic approaches. *Biological psychiatry, 50*(11), 884-897.

Norman, R. M. (2014). Are the effects of duration of untreated psychosis socially mediated? *The Canadian Journal of Psychiatry / La Revue canadienne de psychiatrie, 59*(10), 518-522.

Norman, R. M., & Malla, A. K. (2001). Duration of untreated psychosis: a critical examination of the concept and its importance. *Psychological Medicine, 31*(03), 381-400.

Tukey, J. W. (1977). Exploratory data analysis.

Valmaggia, L. R., Freeman, D., Green, C., Garety, P., Swapp, D., Antley, A., . . . Bebbington, P. (2007). Virtual reality and paranoid ideations in people with an 'at-risk mental state' for psychosis. *The British Journal of Psychiatry, 191*(51), s63-s68.

Appendices

Appendix 1: Adapted Standard Quality Assessment Criteria for Evaluating Primary Research Papers (QAS)

Name of Study:					
		2	**1**	**0**	**NA**
1	Question / objective sufficiently described?				
2	Study design evident and appropriate?				
3	Method of subject/comparison group selection or source of information/input variables described and appropriate?				
4	Subject (and comparison group, if applicable) characteristics sufficiently described?				
5	Outcome and (if applicable) exposure measure(s) well defined and robust to measurement / misclassification bias? Means of assessment reported?				
6*	Measure of social support or isolation validated?				
7*	Measure of recovery validated?				
8	Sample size appropriate?				
9	Analytic methods described/justified and appropriate?				
10*	Method of analysis direct comparison between two variables or part of e.g. regression model?				
11	Some estimate of variance is reported for the main results?				
12	Controlled for confounding?				
13	Results reported in sufficient detail?				
14	Conclusions supported by the results?				

Adapted from: Kmet, L.M., Lee, R.C., & Cook, L.S. (2004). *Standard quality assessment criteria for evaluating primary research papers from a variety of fields*. Alberta Heritage Foundation for Medical Research. http://www.ihe.ca/documents/HTA-FR13.pdf

Appendix 2: Summary of Joint Project and Each Researcher's Contribution

This project used a virtual reality paradigm to investigate trust in clinical paranoia. The virtual reality scenario was developed and utilised in a previous University College London Clinical Psychology Doctoral Thesis by Dr Maikke Elenbaas, submitted in 2013. The current research was completed by Hannah Reidy (the author) and Gail Wingham (GW) (joint project researcher). Both were supervised by Dr Miriam Fornells-Ambrojo and Professor Chris Barker. The current author's thesis uses the virtual reality scenario to examine links between social connectedness and attachment with trust in a sample with clinical paranoia. There were two contingency manipulations within the virtual reality paradigm (high and low) GW's research examines links between contingency condition and trust of avatar, as well as the role of focus of self-focussed attention in this relationship, and the feasibility of using virtual reality for research with individuals with clinical paranoia.

Within the current thesis, the research measurement choices were led by Hannah Reidy under the supervision of Dr Miriam Fornells-Ambrojo and Professor Chris Barker. Decisions were discussed throughout with the joint project researcher Gail Wingham (GW) to ensure feasibility of proposed data collection and to determine the order of research for the protocol. The researchers shared measures of objective trust (minimum distance maintained from the avatar), Sense of Presence (Slater, McCarthy, & Maringelli, 1998) and attention checks of participants within the scenario (Elenbaas, 2014; Fornells-Ambrojo et al., 2016). Small non-overlapping sections of the short debrief interview were also utilised by both researchers. All other measures were used independently in the two empirical papers.

Ethical approval was sought jointly for the two research projects by both researchers, and research governance processes completed together. Both researchers attended set-up meetings with involved NHS services to introduce the projects, answer questions and recruit participants, and continued to liaise with NHS services throughout.

Data collection was conducted jointly and data entry was shared between the joint researchers. Data analysis and write up of this thesis was conducted entirely by Hannah Reidy.

References:

Elenbaas, M. (2014). Unpublished Doctoral Thesis.

Fornells-Ambrojo, M., Elenbaas, M., Barker, C., Swapp, D., Navarro, X., Rovira, A., . . . Slater, M. (2016). Hypersensitivity to Contingent Behavior in Paranoia: A New Virtual Reality Paradigm. *The Journal of nervous and mental disease, 204*(2), 148-152.

Slater, M., McCarthy, J., & Maringelli, F. (1998). The influence of body movement on subjective presence in virtual environments. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 40*(3), 469-477.

Appendix 3: Favourable ethical approval confirmation

NHS
Health Research Authority
NRES Committee London - Camberwell St Giles
Level 3, Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT
[redacted]

10 August 2015

Dr. Miriam Fornells-Ambrojo
Clinical Psychologist, Step Team
South London and Maudsley NHS Foundation Trust
Step Team, 12 Windsor Walk,
Denmark Hill
London
SE5 8BB

Dear Dr. Fornells-Ambrojo

Study title:	**Investigating social factors and affective processes in individuals with clinical paranoia: a virtual reality study.**
REC reference:	**15/LO/1197**
IRAS project ID:	**172018**

Thank you for your letter of 6th August 2015, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered in correspondence by a Sub-Committee of the REC at a meeting held on 10th August 2015. A list of the Sub-Committee members is attached.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact the REC Manager, Tina Cavaliere, [redacted]. Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation

as revised, subject to the conditions specified below.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact [redacted] The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from NRES. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Copies of advertisement materials for research participants [Research Poster]	3	03 August 2015
Evidence of Sponsor insurance or indemnity (non NHS Sponsors only) [Insurance Certificate]	1	12 June 2015
GP/consultant information sheets or letters [HCP Information Sheet]	1	15 January 2015
Interview schedules or topic guides for participants [Qual Interview qus]	2	01 July 2015
IRAS Checklist XML [Checklist_18062015]		18 June 2015
IRAS Checklist XML [Checklist_01072015]		01 July 2015
IRAS Checklist XML [Checklist_06082015]		06 August 2015
IRAS Checklist XML [Checklist_06082015]		06 August 2015
Letter from sponsor [Letter from Sponsor]	1	12 June 2015
Non-validated questionnaire [Sense of Presence non-validated]	2	01 July 2015
Non-validated questionnaire [TICR non-validated]	2	01 July 2015
Non-validated questionnaire [Detection of Contingency and Attention Checks]	2	01 July 2015
Non-validated questionnaire [Reading the Eyes non-validated]	2	01 July 2015
Participant consent form [Participant consent form]	2	03 August 2015
Participant information sheet (PIS) [Participant Information Sheet]	3	03 August 2015
REC Application Form [REC_Form_18062015]		18 June 2015
REC Application Form [REC_Form_06082015]		06 August 2015
Research protocol or project proposal [Research Protocol]	3	06 May 2015
Summary CV for Chief Investigator (CI) [CI CV]	1	13 March 2015
Summary CV for student [CV Gail Wingham and Hannah Reidy merged]	1	12 June 2015
Summary CV for supervisor (student research) [Chris Barker CV]	1	01 July 2015
Summary, synopsis or diagram (flowchart) of protocol in non technical language [Research Flow Chart]	1	01 April 2015
Validated questionnaire [RQ]	1	12 June 2015
Validated questionnaire [CAPE 42 item]	2	01 July 2015
Validated questionnaire [FAQ validated]	2	01 July 2015
Validated questionnaire [FESFS-2013 validated]	2	01 July 2015
Validated questionnaire [GPTS validated]	2	01 July 2015
Validated questionnaire [PANAS Validated]	2	01 July 2015
Validated questionnaire [PSYRATS-D validated]	2	01 July 2015

Validated questionnaire [RG UK]	1	01 July 2015
Validated questionnaire [SIAS validated]	1	01 July 2015
Validated questionnaire [SNI validated]	2	01 July 2015
Validated questionnaire [SOS validated]	2	01 July 2015
Validated questionnaire [UCLA loneliness validated]	2	01 July 2015
Validated questionnaire [SEAT validated]	1	01 July 2015

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document *"After ethical review – guidance for researchers"* gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

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

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website:
http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

HRA Training

We are pleased to welcome researchers and R&D staff at our training days – see details at http://www.hra.nhs.uk/hra-training/

15/LO/1197	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project.

Yours sincerely

Pp [redacted]

Mr John Richardson
Chair

[redacted]

Enclosures: *List of names and professions of members who were present at the meeting and those who submitted written comments*

"After ethical review – guidance for researchers"

Copy to: *Mr Dave Wilson*
Mrs Angela Williams, NoCLOR

NRES Committee London - Camberwell St Giles

Attendance at Sub-Committee of the REC meeting on 14 August 2015

Committee Members:

Name	*Profession*	*Present*	*Notes*
Mrs Jennifer Bostock	Philosopher of Psychiatry	Yes	
Mr John Richardson (Chair)	Retired Director of COREC: former Ecumenical Officer for Churches Together in South London	Yes	

Also in attendance:

Name	*Position (or reason for attending)*
Miss Claudia Harrison	REC Assistant

Appendix 4: Participant Information Sheet (note that Trust specific logos were amended for the different EIPTs approached for the study)

Information Sheet
Version 4: 17.08.15

South West London and St George's NHS
Mental Health NHS Trust

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: UNDERSTANDING SOCIAL INTERACTIONS IN CLINICAL POPULATIONS: AN EVALUATION OF A VIRTUAL FLATMATE

We would like to invite you to take part in a study looking at people's reactions to virtual environments. This project is part of two doctorate research projects. Please take time to read the following information carefully and ask us if there is anything that is not clear to you or if you would like more information. Alternatively, one of our team will go through the information sheet with you and answer any questions you have.

Why have I been invited to take part in the study?
You have been invited to take part in the study because we are looking for volunteers who are 18 years old or above. We are specifically looking for individuals who are currently involved with community mental health services. We hope to involve 60 participants for this study.

Do I have to take part?
It is up to you to decide whether or not to take part. We will describe the study and go through this information sheet. If you do decide to take part you will be given this information sheet to keep, and be asked to sign a consent form. In this consent for we will ask to have access your medical notes. This is only because relevant sections of your medical notes may be required to be looked at by the research team should my care coordinator not be able to access this information on the researcher's behalf. This is optional and your participation does not depend on it. You are still free to withdraw at any time, without giving a reason. This will not affect the standard of care you receive.

What will happen if I decide to take part?
If you decide to take part in this study, we will invite you to visit our virtual reality suite at University College London for a one-off appointment. We expect that this appointment will take a maximum of 2 hours and you will be reimbursed for your time. Our researchers can meet you on any part of your journey to assist you with travelling to the location.

The main thing you will be asked to do will be to explore a virtual environment. Brief questionnaires will be used to assess how realistic the environment is. You will be asked to complete the following steps:

Part 1 - Questionnaires: Prior to entering the virtual environment you will be asked to complete a number of brief questionnaires about your feelings at the time and some background information.

Part 2 - Virtual Reality: After completion of the questionnaire, we will invite you to enter the virtual reality room representing a student flat. You will be given instructions in the use of virtual reality before you start. You will be asked to wear glasses that produce three-dimensional images and you will be invited to remain in the student flat for a brief time and

interact with a virtual flatmate character. The whole scenario will last 3 minutes. There will be another researcher directly outside the virtual suite at all times to ensure that you feel comfortable during the exercise. During your time in the virtual environment your interaction with the virtual flatmate character will be video recorded by an unobtrusive camera in the ceiling to help us review how you and the virtual character move around the room. The video footage will not be shown to anyone outside the research team and will be destroyed when the research project has been completed.

Part 3 – Questionnaires: Following the virtual reality exercise, we will ask you to complete some final questionnaires about your feelings at that time and to provide feedback on the quality of the virtual interaction with a flat mate avatar.

Part 4 – Interview: A brief interview will as about your experience of the virtual environment.

Will I be paid for my participation?
All participants will be paid £12.50 to thank them for their time. Any travel expenses will be reimbursed.

Are there any disadvantages to taking part?
When people use virtual reality systems they occasionally experience a degree of nausea. If at any time you wish to stop taking part in the study due to this or any other reason, please just say so and we will stop.

There has been some research that suggests that people using virtual reality might experience some disturbance in vision afterwards. No long term studies are known to us, but the studies which have conducted testing after about 30 minutes, and have found that the effect is still sometimes there. It is advised that you do not drive a car, motorcycle, or operate complicated machinery in the four hours following virtual reality. There have been various reported side effects of using virtual reality equipment, such as 'flashbacks'. With any type of video equipment there is a possibility that an epileptic episode may be generated. This, for example, has been reported for computer video games. **If you have epilepsy, please tell us. We would not want you to take part in study in this case.**

What are the possible benefits of taking part?
We cannot promise the study will help you but the information we get from the study will help improve understanding of social interactions for people under the care of mental health services and could help inform better practices and treatments for the future.

What if there is a problem?
If you wish to complain, or have any concerns about any aspect of the way you have been approached or treated by members of staff you may have experienced due to your participation in the research, National Health Service or UCL complaints mechanisms are available to you. Please ask your research doctor if you would like more information on this. In the unlikely event that you are harmed by taking part in this study, compensation may be available.

If you suspect that the harm is the result of the Sponsor's (University College London) or the hospital's negligence then you may be able to claim compensation. After discussing with your research doctor, please make the claim in writing to Dr Miriam Fornells-Ambrojo who is

the Chief Investigator for the research and is based at the Department of Clinical, Educational and Health Psychology, University College London. The Chief Investigator will then pass the claim to the Sponsor's Insurers, via the Sponsor's office. You may have to bear the costs of the legal action initially, and you should consult a lawyer about this.

Will my taking part in the study be kept confidential?

All the information obtained will be kept strictly confidential and you will not be identified. This is done by allocating you an anonymous participant number under which to collect data in the experiment. All data will be collected and stored in accordance with the Data Protection Act 1998.

What will happen if I don't want to carry on with the study?

If you withdraw from the study, we will destroy all your identifiable information e.g. name, contact number, care coordinator etc. However, we may use non-identifiable data that we have collected up until your withdrawal e.g. data from questionnaires that are assigned an anonymous participant number.

What will happen to the results of the research study?

The results of the research will be analysed in order to complete a doctorate in clinical psychology and the findings will be published in a scientific journal and may be presented at conferences. You will not be identified in any report or publication. Please inform Hannah Reidy or Gail Wingham if you would like a copy of the study's findings.

Who is organising this study?

The research is being organised and funded by UCL.

Who has reviewed the study?

All research in the NHS is looked at by an independent group people, called a Research Ethics Committee, to protect your interests. The study has been reviewed and given favourable opinion by Camberwell St Giles Research Ethics Committee (Project ID 15/LO/1197).

Thank you for considering taking part and taking the time to read this information sheet.

Research Team Members:

Hannah Reidy, Trainee Clinical Psychologist, Department of Clinical, Educational and Health Psychology, University College London. [redacted]

Gail Wingham, Trainee Clinical Psychologist, Department of Clinical, Educational and Health Psychology, University College London. [redacted]

Dr Miriam Fornells-Ambrojo, Lecturer in Clinical Psychology, Department of Clinical, Educational and Health Psychology, University College London. [redacted]

Appendix 5: Green's Paranoid Thought Scales (Screening Questionnaire)

Version 2 01.07.15

GPTS

Participant no:

Instructions: Please read each of the statements carefully.
They refer to thoughts and feelings you may have had about others **over the last month**.
Think about the last month and **indicate the extent of these feelings** from 1 (Not at all) to 5 (Totally).
Please complete both **Part A and Part B**.
(N.B. Please do not rate items according to any experiences you may have had under the influence of drugs.)

Part A

Statement	Not at all		Somewhat		Extremely
1. I spent time thinking about friends gossiping about me	1	2	3	4	5
2. I often heard people referring to me	1	2	3	4	5
3. I have been upset by friends and colleagues judging me critically	1	2	3	4	5
4. People definitely laughed at me behind my back	1	2	3	4	5
5. I have been thinking a lot about people avoiding me	1	2	3	4	5
6. People have been dropping hints for me	1	2	3	4	5
7. I believed that certain people were not what they seemed	1	2	3	4	5
8. People talking about me behind my back upset me	1	2	3	4	5
9. I was convinced that people were singling me out	1	2	3	4	5
10. I was certain that people have followed me	1	2	3	4	5
11. Certain people were hostile towards me personally	1	2	3	4	5
12. People have been checking up on me	1	2	3	4	5
13. I was stressed out by people watching me	1	2	3	4	5
14. I was frustrated by people laughing at me	1	2	3	4	5
15. I was worried by people's undue interest in me	1	2	3	4	5
16. It was hard to stop thinking about people talking about me behind my back	1	2	3	4	5

Part B

Statement	Not at all		Somewhat		Extremely
1. Certain individuals have had it in for me	1	2	3	4	5
2. I have definitely been persecuted	1	2	3	4	5
3. People have intended me harm	1	2	3	4	5
4. People wanted me to feel threatened, so they stared at me	1	2	3	4	5
5. I was sure certain people did things in order to annoy me	1	2	3	4	5
6. I was convinced there was a conspiracy against me	1	2	3	4	5
7. I was sure someone wanted to hurt me	1	2	3	4	5
8. I was distressed by people wanting to harm me in some way	1	2	3	4	5
9. I was preoccupied with thoughts of people trying to upset me deliberately	1	2	3	4	5
10. I couldn't stop thinking about people wanting to confuse me	1	2	3	4	5
11. I was distressed by being persecuted	1	2	3	4	5
12. I was annoyed because others wanted to deliberately upset me	1	2	3	4	5
13. The thought that people were persecuting me played on my mind	1	2	3	4	5
14. It was difficult to stop thinking about people wanting to make me feel bad	1	2	3	4	5
15. People have been hostile towards me on purpose	1	2	3	4	5
16. I was angry that someone wanted to hurt me	1	2	3	4	5

Reference: Green, C. E. L., Freeman, D., Kuipers, E., Bebbington, P., Fowler, D., Dunn, G., & Garety, P. A. (2008). Measuring ideas of persecution and social reference: the Green et al. Paranoid Thought Scales (GPTS). Psychological medicine, 38(01), 101-111.

Appendix 6: Participant Consent Form (note that Trust specific logos were amended for the different EIPTs approached for the study

Consent Form
Version 3: 17.06.16
THIS STUDY HAS BEEN APPROVED BY
CAMBERWELL ST-GILES NRES COMMITTEE LONDON
Project ID 15/LO/1197

Patient Identification Number:
Date:

CONSENT FORM

PROJECT TITLE: UNDERSTANDING SOCIAL INTERACTIONS IN CLINICAL POPULATIONS: AN EVALUATION OF A VIRTUAL FLATMATE

Name of Researchers: Hannah Reidy & Gail Wingham

Thank you for your interest in taking part in this research. If you have any questions arising from the information Sheet or explanation already given to you, please ask the researcher before you decide whether to take part. You will be given a copy of this Consent Form to keep and refer to at any time.

1. I confirm that I have read and understand the information sheet dated 15.01.15 (Version 1) for the above study. I have had the opportunity to ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐
3. I understand that if I decide to withdraw from the study, any identifiable data collected up to this point will be destroyed but non-identifiable data may be used for the research. ☐
4. I understand that I must not take part in the study if I have epilepsy. ☐
5. I understand that the information I have submitted will be published as a report and I will be sent a copy if I request this. Confidentiality and anonymity will be maintained and it will not be possible to identify me from any publications. ☐
6. I understand that data collected during the study may be looked at by individuals from University College London, from regulatory authorities such as external auditors checking how the research is being run, or from the NHS Trust where it is relevant to my taking part in the research. I give permission for these individuals to have access to my records. ☐
7. *Optional:* I understand that relevant sections of my medical notes may be required to be looked at by the research team should my care coordinator not be able to access this information on the researcher's behalf. I give permission for the research to have access to my medical notes, only for the duration that I am involved in the research. ☐
8. I agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study. ☐

Name of Participant:.....

Signature:.....
Date:.....

Name of researcher
taking consent :.....

Signature:.....
Date.....

If you would like to receive a copy of the research findings once the study is complete please tick here: ☐

When completed: 1 for participant, 1 for researcher, 1 for documenting in medical notes

Appendix 7: UCLA Loneliness Scale

Version 2, 01.07.2015

UCLA Scale:
Participant No:

INSTRUCTIONS: Indicate how often each of the statements below is descriptive of you.

O indicates "I often feel this way"
S indicates "I sometimes feel this way"
R indicates "I rarely feel this way"
N indicates "I never feel this way"

	Often	Sometimes	Rarely	Never
1. I am unhappy doing so many things alone	O	S	R	N
2. I have nobody to talk to	O	S	R	N
3. I cannot tolerate being so alone	O	S	R	N
4. I lack companionship	O	S	R	N
5. I feel as if nobody really understands me	O	S	R	N
6. I find myself waiting for people to call or write	O	S	R	N
7. There is no one I can turn to	O	S	R	N
8. I am no longer close to anyone	O	S	R	N
9. My interests and ideas are not shared by those around me	O	S	R	N
10. I feel left out	O	S	R	N
11. I feel completely alone	O	S	R	N
12. I am unable to reach out and communicate with those around me	O	S	R	N
13. My social relationships are superficial	O	S	R	N
14. I feel starved for company	O	S	R	N
15. No one really knows me well	O	S	R	N
16. I feel isolated from others	O	S	R	N
17. I am unhappy being so withdrawn	O	S	R	N
18. It is difficult for me to make friends	O	S	R	N
19. I feel shut out and excluded by others	O	S	R	N
20. People are around me but not with me	O	S	R	N

Reference: Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of personality assessment*, *66*(1), 20-40.

Appendix 8: Significant Others Scale

SOS

Version 2 01.07.2015

Participant no: _____ date: _____

Please list below people who are important in your life. Possible relationships include friends, partner, mother, father, children, brothers, sisters, other relatives, work colleagues, and so on. For each person you list, circle a number from 1 to 7 to show how well they provide the type of help listed. The second part of each question asks you to rate how you would like things to be if they were exactly as you would most hope for. Again circle a number from 1 to 7 to show what rating this would involve. Use further *Significant Others Scale* sheets if appropriate.

name/relationship:			*never*			*sometimes*			*always*
1	*a*	can you trust, talk to frankly and share feelings with this person?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
2	*a*	can you lean on and turn to this person in times of difficulty?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
3	*a*	do they give you practical help?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
4	*a*	can you spend time with them socially?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
name/relationship:			*never*			*sometimes*			*always*
1	*a*	can you trust, talk to frankly and share feelings with this person?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
2	*a*	can you lean on and turn to this person in times of difficulty?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
3	*a*	do they give you practical help?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
4	*a*	can you spend time with them socially?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
name/relationship:			*never*			*sometimes*			*always*
1	*a*	can you trust, talk to frankly and share feelings with this person?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
2	*a*	can you lean on and turn to this person in times of difficulty?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
3	*a*	do they give you practical help?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7
4	*a*	can you spend time with them socially?	1	2	3	4	5	6	7
	b	what rating would your ideal be?	1	2	3	4	5	6	7

please turn over

name/relationship:			***never***			***sometimes***			***always***
1	*a*	can you trust, talk to frankly and share feelings with this person?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2	*a*	can you lean on and turn to this person in times of difficulty?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3	*a*	do they give you practical help?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4	*a*	can you spend time with them socially?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*

name/relationship:			***never***			***sometimes***			***always***
1	*a*	can you trust, talk to frankly and share feelings with this person?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2	*a*	can you lean on and turn to this person in times of difficulty?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3	*a*	do they give you practical help?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4	*a*	can you spend time with them socially?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*

name/relationship:			***never***			***sometimes***			***always***
1	*a*	can you trust, talk to frankly and share feelings with this person?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2	*a*	can you lean on and turn to this person in times of difficulty?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3	*a*	do they give you practical help?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4	*a*	can you spend time with them socially?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*

name/relationship:			***never***			***sometimes***			***always***
1	*a*	can you trust, talk to frankly and share feelings with this person?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
2	*a*	can you lean on and turn to this person in times of difficulty?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
3	*a*	do they give you practical help?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
4	*a*	can you spend time with them socially?	*1*	*2*	*3*	*4*	*5*	*6*	*7*
	b	what rating would your ideal be?	*1*	*2*	*3*	*4*	*5*	*6*	*7*

emotional support: *actual av.___ ideal av.___ ;* ***practical support:*** *actual av.___ ideal av.___*

Reference: Power, M., Champion, L., & Aris, S. (1988). The development of a measure of social support: the Significant Others (SOS) Scale. *British Journal of Clinical Psychology, 27*(4), 349-358.

Appendix 9: Resource Generator UK

Institute of Psychiatry

at The Maudsley

Resource Generator-UK

KING'S College LONDON

How to complete this questionnaire

The following questions are about the people you currently know. These might be family members, friends or acquaintances, but they do not include friends of friends or people that you are not personally in contact with. The questions will ask if you currently know someone with a particular skill or resource - e.g.:

Do you currently have access to someone who ... ?	No	Yes	Immediate Family	Wider Family	Friend	Neighbour	Colleague	Acquaintance
1 ... can repair a broken-down car								

Please tick the 'yes' column if you currently have access to someone or 'no' if you don't.

If 'yes', then please tick the column(s) corresponding to the person or people you would be likely to approach if you needed that particular skill or resource.

If you know someone with more than one skill or resource you can refer to this person more than once.

If you are planning to use this questionnaire in the United Kingdom, or validate a version for a different country, please contact the author first:

Martin Webber, Institute of Psychiatry, Kings College London
[redacted]

(A) Do you personally know anyone with the skill or resource listed below that you are able to gain access to within one week if you needed it?

Please answer all these questions, even if you possess the skill or resource yourself or if you have never needed to ask for it before. You will be asked about your skills later on. If 'yes', you may tick more than one box.

Do you currently have access to someone who ... ?	No	Yes	Immediate Family	Wider Family	Friend	Neighbour	Colleague	Acquaintance
1 ... can repair a broken-down car								
2 ... is a reliable tradesman (eg plumber, electrician)								
3 ... can speak another language fluently								
4 ... knows how to fix problems with computers								
5 ... is good at gardening								
6 ... has a professional occupation								
7 ... is a local councillor								
8 ... works for your local council								
9 ... can sometimes employ people								
10 ... knows a lot about government regulations								
11 ... has good contacts with the local newspaper, radio or t.v.								
12 ... knows a lot about health and fitness								
13 ... knows a lot about DIY								

(B) If you need someone to help you in the following areas, would you be able to obtain this help from anyone <u>within one week</u>?

Please answer all these questions, even if you have never needed to ask for it before. If 'yes', you may tick more than one box.

Do you currently personally know anyone who would ... ?	No	Yes	Immediate Family	Wider Family	Friend	Neighbour	Colleague	Acquaintance
1 ... give you sound advice about money problems								
2 ... give you sound advice on problems at work								
3 ... help you to move or dispose of bulky items (eg lifting or use of a van)								
4 ... help you with small jobs around the house								
5 ... do your shopping if you are ill								
6 ... lend you a small amount of money (eg for a local taxi fare)								
7 ... give you careers advice								
8 ... discuss politics with you								
9 ... give you sound legal advice								
10 ... give you a good reference for a job								
11 ... get you cheap goods or 'bargains'								
12 ... help you to find somewhere to live if you had to move home								
13 ... lend you a large amount of money (eg for a deposit on a flat or house)								
14 ... look after your home or pets if you go away								

(C) Are you ... ?	Yes	No
1 ... able to repair a broken-down car		
2 ... a tradesman (eg plumber, electrician)		
3 ... able to speak another language fluently		
4 ... knowledgeable about fixing problems with computers		
5 ... good at gardening		
6 ... someone with a professional occupation		
7 ... a local councillor		
8 ... working for your local council		
9 ... able to sometimes employ people		
10 ... knowledgeable about government regulations		
11 ... someone with good contacts with a local newspaper, radio or t.v.		
12 ... knowledgeable about health and fitness		
13 ... knowledgeable about DIY		

Thank you for taking the time to complete this questionnaire.

Reference: Webber, M. P., & Huxley, P. J. (2007). Measuring access to social capital: The validity and reliability of the Resource Generator-UK and its association with common mental disorder. Social Science & Medicine, 65(3), 481-492.

Appendix 10: First Episode Social Functioning Scale (FESFS)
Version 2, 01.07.2015
Participant no:

FESFS -- Self-Report Sections 1-4

Please answer each question honestly, using the choices suggested.
If you answer Never, or if you find a question doesn't apply to you and answer N/A, please explain why.

1. Interacting with people

1.1 CLERKS, COFFEE SHOP…

1.1.a I find it easy to interact with waiters, cashiers, and salespeople (e.g. small talk, asking for information, making a purchase).

Totally Disagree Disagree Agree Totally Agree

1.1.b In the past 3 months, I have been interacting with waiters, cashiers or salespeople.

Never Sometimes Often Always N/A
(don't go near stores) (once or twice/month) (more than once/week) (most days)

If N/A or Never, please explain: (e.g. not interested, no need)

_____

_____

1.2 AUTHORITY/ ADULTS

1.2.a I find it easy to interact with authority figures (e.g. teacher, boss, doctor, others' parents…).

Totally Disagree Disagree Agree Totally Agree

1.2.b In the past 3 months, I have been interacting with authority figures.

Never Sometimes Often Always N/A
(don't) (less than once a week) (most days) (everyday)

If N/A or Never, please explain: (e.g. no contact with authority figures)

_____

_____

1.3 ACQUAINTANCES

1.3.a I find it easy to talk with people my age I know just a little bit.

Totally Disagree Disagree Agree Totally Agree

1.3.b In the past 3 months, I have been talking to people my age I know just a little bit.

Never N/A (don't) Sometimes (less than once a month) Often (at least once a week) Always (most days)

If N/A or Never, please explain: (e.g. no interest)

_____

_____

1.4 ASSERTIVENESS

1.4.a I know how to stand up for myself when needed.

Totally Disagree Disagree Agree Totally Agree

1.4.b In the past 3 months, I have been able to stand up for myself.

Never N/A Sometimes (less than weekly) Often (most days) Always (everyday)

If N/A or Never, please explain: (e.g. no need to)

_____

_____

On a scale of 1 to 10, how important is it for you to be good the areas of interacting with people just mentioned of (interacting with waiters, authority figures and acquaintances, and being assertive)?

1 2 3 4 5 6 7 8 9 10
(not at all important) (extremely important)

Comments:_____

_____

_____

2. Friends and activities

2.1 SOLO ACTIVITIES

2.1.a I am really good in solo activities such as going to the gym, going to the movies, chatting on the net, taking lessons (music, painting, etc). Please do not count watching TV, listening to music or playing videogames.

Totally Disagree Disagree Agree Totally Agree

2.1.b In the past 3 months, I have been doing solo activities such as going to the gym, going to the movies, chatting on the net, taking lessons (music, painting, etc).

Never (don't) Sometimes (less than once a month) Often (several times a month) Always (few times/week) N/A

If N/A or Never, please explain: (e.g. too busy, no interest)

_____

_____

2.2 MEANINGFUL ACTIVITIES

2.2.a I try to do things that are really important to me (specific hobbies, passions…).

Totally Disagree Disagree Agree Totally Agree

2.2.b In the past 3 months, I have been doing things that are really important to me.

Never (don't) Sometimes (less than once a month) Often (several times a month) Always (a few times/week) N/A

If N/A or Never, please explain: (e.g. too busy, no hobbies)

_____

_____

2.3 BALANCING TIME ALONE AND WITH OTHERS

2.3.a I am able to balance the amount of time I spend with others and by myself.

Totally Disagree Disagree Agree Totally Agree

2.3.b In the past 3 months, I have been spending most of my days alone.

Never Sometimes Often Always N/A

(a few days a week) (most days) (everyday)

If N/A or Never, please explain: (e.g. live with people, too busy)

_____

_____

2.4 BEST FRIEND

2.4.a I feel I have at least one best friend with whom I can share important things that happen to me.

Totally Disagree Disagree Agree Totally Agree

2.4.b In the past 3 months, I have spent time with my best friend (live or by phone).

Never Sometimes Often Always N/A

(spoke at least once) (speak or see every2/3 weeks) (speak or see weekly)

If N/A or Never, please explain: (e.g. no best friend, too busy)

_____

_____

2.5 BUDDIES

2.5.a I have friends that I can hang out with, do stuff with (shopping, movies, go out…).

Totally Disagree Disagree Agree Totally Agree

2.5.b In the past 3 months, I have spent time doing activities with my friends.

Never Sometimes Often Always N/A

(at least once a month) (several times a month) (weekly)

If N/A or Never, please explain: (e.g. no money, too busy)

_____

_____

2.6 ABILITIES TO DEVELOP FRIENDSHIPS

2.6.a I am able to make new friends by suggesting getting together, making invitations or phoning people up.

Totally Disagree Disagree Agree Totally Agree

2.6.b In the past 3 months, I have tried to develop a potential friendship with someone.

Never Sometimes Often Always

N/A

(made an invitation or accepted one) (invited, suggested activity or did something with a new person more than once) (very sociable, talk to new people and open to meeting 3x's or more)

If N/A or Never, please explain: (e.g not met anyone, no interest)

_____

_____

On a scale of 1 to 10, overall how important is it for you to be good in the areas of friendship and social activities just mentioned (solo, meaningful activities, balancing time alone and with others, develop new friendships, spending time with best friends or buddies)?

1 2 3 4 5 6 7 8 9 10

(not at all important) (extremely important)

Comments:_____

_____

_____

3. Intimacy

3.1 DATING

3.1.a I am quite comfortable dating.

Totally Disagree Disagree Agree Totally Agree

3.1.b In the past 3 months, I have been dating.

Never Sometimes Often Always N/A

(had 2 dates or less) (more than 3 dates) (have been seeing someone weekly)

If N/A or Never, please explain: (e.g. no interest, too trying)

_____

_____

3.2 HAVING BOYFRIEND/GIRLFRIEND OR SPOUSE

3.2.a I enjoy having a stable boy/girlfriend or spouse.

Totally Disagree Disagree Agree Totally Agree

3.2.b In the past 3 months, I have spent time with my stable boy/girlfriend or spouse.

Never Sometimes Often Always N/A

(every few weeks) (once a week, for less than a month) (weekly for more than a month)

If N/A or Never, please explain: (e.g. never had a boy/girlfriend, not interested)

_____

_____

3.3 SEXUAL RELATIONSHIP

3.3.a I am interested in sex.

Totally Disagree Disagree Agree Totally Agree

3.3.b In the past 3 months, I have had sex with someone.

Never Sometimes Often Always N/A

(at least once) (twice a month or more) (weekly)

If N/A or Never, please explain: (e.g. religious beliefs, not interested)

_____

_____

3.4 EMOTIONAL CLOSENESS

3.4.a I feel I am able to share feelings, inner thoughts, and be close with my stable boy/girlfriend or spouse (when I have one).

Totally Disagree Disagree Agree Totally Agree

3.4.b In the past 3 months, I have shared my feelings, inner thoughts, and have been close with my stable boy/girlfriend or spouse.

Never Sometimes Often Always N/A

(at least once) **(**twice or more/month) (weekly or more)

If N/A or Never, please explain: (e.g. no one to share with, not interested)

_____

_____

3.5 GRASPING SITUATIONS

3.5.a I can quickly understand what is going on in most situations involving other people.

Totally Disagree Disagree Agree Totally Agree

3.5.b In the past 3 months, I have been able to quickly understand most situations involving other people.

Never Sometimes Often Always N/A

(less than weekly) (most days) (everyday)

If N/A or Never, please explain: (e.g. no need to)

_____

_____

On a scale of 1 to 10, overall how important is it for you to be good in the areas of intimacy just mentioned (dating, having a boy/girlfriend/spouse, sex, emotional closeness, and grasping situations)?

1 2 3 4 5 6 7 8 9 10
(not at all important) (extremely important)

Comments:_____
_____
_____

4. Family

4.1 PARENTS

4.1.a I can talk to my parents about things that matter to me.

Totally Disagree Disagree Agree Totally Agree

4.1.b In the past 3 months, I have talked to my parents about things that matter to me.

Never Sometimes Often Always
N/A
(once a month) (every 2 weeks) (weekly)

If N/A or Never, please explain: (e.g. don't have contact with parents)
_____
_____

4.2 RELATIONSHIP WITH PARENTS

4.2.a My parents and I typically get along.

Totally Disagree Disagree Agree Totally Agree

4.2.b In the past 3 months, I have spent time without big conflicts with one (or both) of my parents.

Never Sometimes Often Always
N/A
(less than once/month) (at least once a month) (weekly)

If N/A or Never, please explain: (e.g. don't have contact with parents)
_____

4.3 RELATIONSHIP WITH FAMILY

4.3.a I get along well with my family (siblings, grandparents, uncles, aunts, cousins).

Totally Disagree Disagree Agree Totally Agree

4.3.b In the past 3 months, I have spent time (live or phone or other means) with at least one member of my family.

Never Sometimes Often Always
N/A
(once) (at least once a month) (weekly)

If N/A or Never, please explain: (e.g. no extended family, not interested)

_____

_____

On a scale of 1 to 10, how important is it for you to be good in the areas of family just mentioned (being able to talk and not being in conflict with parents, getting along with family)?

1 2 3 4 5 6 7 8 9 10
(not at all important) (extremely important)

Comments:_____

_____

_____

Reference: Lecomte, T., Corbière, M., Ehmann, T., Addington, J., Abdel-Baki, A., & MacEwan, B. (2014). Development and preliminary validation of the First Episode Social Functioning Scale for early psychosis. *Psychiatry research*, *216*(3), 412-417

Appendix 11: Relationship Questionnaire

Relationship Questionnaire
Participant No:

Following are four general relationship styles that people often report. Place a checkmark next to the letter corresponding to the style that best describes you or is closest to the way you are.

____ A. It is easy for me to become emotionally close to others. I am comfortable depending on them and having them depend on me. I don't worry about being alone or having others not accept me.

____ B. I am uncomfortable getting close to others. I want emotionally close relationships, but I find it difficult to trust others completely, or to depend on them. I worry that I will be hurt if I allow myself to become too close to others.

____ C. I want to be completely emotionally intimate with others, but I often find that others are reluctant to get as close as I would like. I am uncomfortable being without close relationships, but I sometimes worry that others don't value me as much as I value them.

____ D. I am comfortable without close emotional relationships. It is very important to me to feel independent and self-sufficient, and I prefer not to depend on others or have others depend on me.

Now please rate each of the relationship styles above to indicate how well or poorly each description corresponds to your general relationship style.

Style A

1	2	3	4	5	6	7
Disagree Strongly			Neutral/ Mixed			Agree Strongly

Style B

1	2	3	4	5	6	7
Disagree Strongly			Neutral/ Mixed			Agree Strongly

Style C

1	2	3	4	5	6	7
Disagree Strongly			Neutral/ Mixed			Agree Strongly

Style D

1	2	3	4	5	6	7
Disagree Strongly			Neutral/ Mixed			Agree Strongly

Reference: Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: a test of a four-category model. *Journal of personality and social psychology, 61*(2), 226.

Appendix 12: Paranoia Scale

PS Version 1. 01.07.15

Participant no:

Instructions: Indicate much each of the statements below are applicable to you.

Statement	Not at all		Somewhat		Extremely
1. Someone has it in for me	1	2	3	4	5
2. I sometimes feel as if I'm being followed	1	2	3	4	5
3. I believe that I have often been punished without cause	1	2	3	4	5
4. Some people have tried to steal my ideas and take credit for them	1	2	3	4	5
5. My parents and family find more fault with me than they should	1	2	3	4	5
6. No one really cares much what happens to you	1	2	3	4	5
7. I am sure I get a raw deal form life	1	2	3	4	5
8. Most people will use somewhat unfair means to gain profit or an advantage, rather than lose it	1	2	3	4	5
9. I often wonder what hidden reason another person may have for doing something nice for you	1	2	3	4	5
10. It is safer to trust no on	1	2	3	4	5
11. I have often felt that strangers were looking at me critically	1	2	3	4	5
12. Most people make friends because friends are likely to be useful to them	1	2	3	4	5
13. Someone has been trying to influence my mind	1	2	3	4	5
14. I am sure I have been talked about behind my back	1	2	3	4	5
15. Most people inwardly dislike putting themselves out to help other people	1	2	3	4	5
16. I tend to be on my guard with people who are somewhat more friendly than I expected	1	2	3	4	5
17. People have said insulting and unkind things about me	1	2	3	4	5
18. People often disappoint me	1	2	3	4	5
19. I am bothered by people outside, in cars, in stores etc. watching me	1	2	3	4	5
20. I have often found people jealous of my good ideas just because they had not thought of them first	1	2	3	4	5

Reference: Fenigstein, A., & Vanable, P. A. (1992). Paranoia and self-consciousness. *Journal of personality and social psychology, 62*(1), 129.

Appendix 13: Community Assessment of Psychic Experiences

Participant No:	Do you ever…				How distressed are you by this experience?			
	Never	Sometimes	Often	Nearly always	Not distressed	A bit distressed	Quite distressed	Very distressed
	(move straight onto the next question, don't fill out the right hand side of this form)	(fill out the right hand columns about distress)						
1. Do you ever feel sad?								
2. Do you ever feel as if people seem to drop hints about you or say things with a double meaning?								
3. Do you ever feel that you are not a very animated person?								
4. Do you ever feel that you are not much of a talker when you are conversing with other people?								
5. Do you ever feel as if things in magazines or on TV were written especially for you?								
6. Do you ever feel as if some people are not what they seem to be?								
7. Do you ever feel as if you are being persecuted in some way?								
8. Do you ever feel that you experience few or no emotions at important events?								
9. Do you ever feel pessimistic about everything?								
10. Do you ever feel as if there is a conspiracy against you?								
11. Do you ever feel as if you are destined to be someone very important?								
12. Do you ever feel as if there is no future for you?								
13. Do you ever feel that you are a very special or unusual person?								
14. Do you ever feel as if you do not want to live anymore?								
15. Do you ever think that people can communicate telepathically?								
16. Do you ever feel that you have no interest to be with other people?								
17. Do you ever feel as if electrical devices such as computers can influence the way you think?								
18. Do you ever feel that you are lacking in motivation to do things?								

19.	Do you ever cry about nothing?								
20.	Do you believe in the power of witchcraft, voodoo or the occult?								
21.	Do you ever feel that you are lacking in energy?								
		Do you ever…				How distressed are you by this experience?			
		Never	Sometimes	Often	Nearly always	Not distressed	A bit distressed	Quite distressed	Very distressed
		(move straight onto the next question, don't fill out the right hand side of this form)	(fill out the right hand columns about distress)						
22.	Do you ever feel that people look at you oddly because of your appearance?								
23.	Do you ever feel that your mind is empty?								
24.	Do you ever feel as if the thoughts in your head are being taken away from you?								
25.	Do you ever feel that you are spending all your days doing nothing?								
26.	Do you ever feel as if the thoughts in your head are not your own?								
27.	Do you ever feel that your feelings are lacking in intensity?								
28.	Have your thoughts ever been so vivid that you were worried other people would hear them?								
29.	Do you ever feel that you are lacking in spontaneity?								
30.	Do you ever hear your own thoughts being echoed back to you?								
31.	Do you ever feel as if you are under the control of some force or power other than yourself?								
32.	Do you ever feel that your emotions are blunted?								
33.	Do you ever hear voices when you are alone?								
34.	Do you ever hear voices talking to each other when you are alone?								
35.	Do you ever feel that you are neglecting your appearance or personal hygiene?								
36.	Do you ever feel that you can never get things done?								
37.	Do you ever feel that you have only few hobbies or interests?								
38.	Do you ever feel guilty?								
39.	Do you ever feel like a failure?								
40.	Do you ever feel tense?								

41.	Do you ever feel as if a double has taken the place of a family member, friend or acquaintance?									
42.	Do you ever see objects, people or animals that other people cannot see?									

Reference: Konings, M., Bak, M., Hanssen, M., Van Os, J., & Krabbendam, L. (2006). Validity and reliability of the CAPE: A self-report instrument for the measurement of psychotic experiences in the general population. *Acta Psychiatrica Scandinavica, 114*(1), 55-61.

Appendix 14: Prompt Sheet for Virtual Reality

1. What do you like about flat sharing?

2. How do you choose flatmates?

3. What makes a good flatmate?

4. What's the best thing about this flat?

Appendix 15: Attention checks for virtual reality scenario

Participant no:

Scenario Feedback and Checks

1. In your experience of your interaction with the virtual flatmate, was there any relationship between what you did and the virtual flatmate's actions? Please Circle

   Yes No

2. If you experienced any relationship between what you did and the virtual flatmates actions, what did you notice? Please write your comments in the space below.

Please circle whether the following statements are true or false

1. One reason that Mark the virtual flatmate gave for why he likes flat sharing is that he has made new friends

   True False

2. When asked who makes a good flatmate, Mark mentioned that the most important thing is that they are tidy.

   True False

Reference: Fornells-Ambrojo, M., Elenbaas, M., Barker, C., Swapp, D., Navarro, X., Rovira, A., . . . Slater, M. (2016). Hypersensitivity to Contingent Behavior in Paranoia: A New Virtual Reality Paradigm. *The Journal of nervous and mental disease, 204*(2), 148-152.

Appendix 16: Sense of Presence Questionnaire

Participant no:

The following questions relate to your recent virtual reality experience. Please read each question and answer as you are instructed in each one.

1. Please rate the sense of actually being in the flat

Abnormal being Experience	1	2	3	4	5	6	7	Normal experience of being in a flat

2. To what extent were there times during the experience when the virtual flat became "reality" for you, and you almost forgot about the "real world" of the laboratory in which the whole experience was actually taking place?

At no time	1	2	3	4	5	6	7	Almost all the time

3. When you think back about your experience, do you think of the virtual flat more as "images that you saw", or more as "somewhere you visited"?

Images that visited/saw	1	2	3	4	5	6	7	Somewhere that I

4. During the experience, which was strongest on the whole, your sense of being in the virtual flat, or being in the real world of the laboratory

Laboratory	1	2	3	4	5	6	7	Virtual flat

5. Consider your memory of being in the flat. How similar is the memory of the virtual reality experience to other memories of "real places" in terms of: visual quality, size, colour and how realistic and vivid it seems in your imagination?

Not at all Similar	1	2	3	4	5	6	7	Very similar

6. During the experience, did you think to yourself that you were actually "just standing in a room wearing equipment" or did the virtual flat "overwhelm" you? The virtual flat overwhelmed me…

Not at all	1	2	3	4	5	6	7	All of the time

Reference: Slater, M., McCarthy, J., & Maringelli, F. (1998). The influence of body movement on subjective presence in virtual environments. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 40*(3), 469-477.

Appendix 17: Adapted Trust in Close Relationships

Participant Number: _____
Instructions:

You have only met Mark the flatmate for a few moments. Using your first impressions of him, please use the 7 point scale shown below to indicate the extent to which you agree or disagree with the following statements.

Strongly Disagree			Neutral			Strongly Agree
-3	-2	-1	0	1	2	3

	Strongly Disagree			Neutral			Strongly Agree
1. Mark seems trustworthy.	-3	-2	-1	0	1	2	3
2. I would feel comfortable confiding in Mark.	-3	-2	-1	0	1	2	3
3. Mark seems like the sort of person that would be ready to offer support.	-3	-2	-1	0	1	2	3
4. Mark might do something to embarrass me.	-3	-2	-1	0	1	2	3
5. Mark could be unpredictable from one day to the next.	-3	-2	-1	0	1	2	3
6. I would feel uncomfortable relying on Mark to make decisions that could affect me.	-3	-2	-1	0	1	2	3
7. Mark seems dependable.	-3	-2	-1	0	1	2	3
8. Mark seems consistent.	-3	-2	-1	0	1	2	3
9. Mark looks like someone who would think about me if we were making a decision.	-3	-2	-1	0	1	2	3
10. Mark looks like someone who would share things with me.	-3	-2	-1	0	1	2	3
11. Mark looks like someone who would react positively if I shared a weakness with him.	-3	-2	-1	0	1	2	3
12. Mark looks like someone who would realise what I mean even if it is difficult to say.	-3	-2	-1	0	1	2	3
13. Mark looks like someone who would be not betray me, even if never found out.	-3	-2	-1	0	1	2	3
14. Mark looks like someone would be unpredictable to the point I would avoid him.	-3	-2	-1	0	1	2	3
15. I feel Mark would keep promises he made to me.	-3	-2	-1	0	1	2	3
16. Mark would help me feel secure in new situations.	-3	-2	-1	0	1	2	3
17. Mark looks like someone who I would believe was telling the truth, even if his excuses seemed unlikely	-3	-2	-1	0	1	2	3

Reference: Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of personality and social psychology, 49*(1), 95.

Appendix 18: Script of interaction between participant and avatar within virtual reality scenario

A=Avatar
P=Participant

A: Hi my name is Mark thanks for coming. What's your name?"

P: (Tells avatar their name)

A: Thanks, OK I'm ready!

P: **What do you like about flat sharing?**

A: I enjoy meeting new people... I have made new friends this way...its great getting to know them, have a laugh... mhm... and it helps to keep the cost of living low so you can live in a better area!

P: **What do you ask potential flatmates before going ahead?**

A: Well, I always meet them in person and get a sense of what they are like... I ask them what they are looking for in a shared flat, what is a typical day like for them, what music they like, if they smoke, if they are lazy about house chores... mhm.. if they like having friends around ... Oh, yeah it is also good to ask them what has been their best and worse experience of flat sharing!

P: **In your experience... who makes a great flatmate?**

A: Mhm... good question... don't know... I'm trying to think .....someone how is easygoing, friendly and fun but who also can give you space... It is also good to have something in common with them, like love for sport, or music...It's hard to answer because I think it really depends on the person... I've got on with people who were completely different from me, sometimes it just works.

P: **What is the best thing about your flat?**

A: The terrace and the view! Come and have a look! (moves to the window)

A: It's amazing to have all this outside space, in the summer we practically live outside! We have great BBQs....

(Phone rings – avatar answers and speaks discreetly on the phone)

A: Hello? Okay..yeah I can be there…okay bye.

A: Oh, sorry but I need to go now... anyway thank you for coming and maybe we can continue the interview some other time?

P: (Answers)

SCENARIO ENDS