

**Attachment Security, Trust and Imagined Attachment Behaviours:
An Exploratory Study within a General Population Sample**

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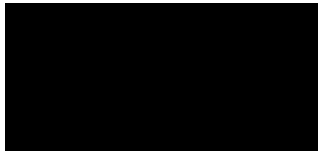
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Thesis declaration form

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Overview

This thesis examines the role of interpersonal bonds across clinical and everyday contexts. Part One presents a systematic review and meta-analysis of the association between therapeutic alliance (TA) and outcome from diverse interventions for psychosis. Correlational meta-analyses showed that both client- and therapist-rated TA were significantly associated with change in global as well as psychotic symptomatology, but not with other outcomes such as global functioning, self-esteem, or quality of life.

Part Two reports on an empirical study that explores associations between attachment security, trust behaviour during a virtual interaction, subjective trust and a new prospective imagery attachment task (the PIAT) within a general population sample. There was preliminary evidence for the PIAT's feasibility, acceptability and internal reliability. Concurrent validity was indicated by significant correlations between attachment security on the Relationship Questionnaire and three of the four PIAT items. Subjective trust and trusting behaviour in virtual reality (VR) were positively correlated with selected PIAT domains, but not with attachment security. The empirical study was a joint project completed with Hayley Dolan (HD), a fellow University College London D.Clin.Psy. Trainee. The findings from HD's thesis are presented separately.

Part Three is a critical appraisal, focusing predominantly on the empirical paper. It reflects on the challenges of recruiting a clinical sample, the importance of a service user voice, the role of interpersonal contingency during virtual interactions and how far mainstream exposure to VR/gaming technology influences contemporary VR research.

Impact Statement

The current systematic review and meta-analysis was the first to synthesise evidence for the correlation between therapeutic alliance (TA) and outcome from interventions for psychosis, beyond an exclusive focus on individual psychotherapy. The empirical paper investigated a novel prospective imagery attachment task (the PIAT). The insights gained could make a valuable contribution to research as well as both clinical practice and training.

1. Novel Prospective Imagery Attachment Task: Research Implications

The PIAT is a novel tool to assess moment-to-moment imagined attachment behaviours. This thesis reports good acceptability and feasibility for the measure, in addition to promising internal reliability and concurrent validity. PIAT items were significantly associated with trust during a virtual reality (VR) interaction.

Given this exciting preliminary evidence, the PIAT could have important research applications. It could be applied within a clinical sample to investigate links between imagined attachment behaviour, attachment security and trust. This may generate important theoretical insights for client groups who find meeting new people and forging close interpersonal relationships especially challenging (e.g. high paranoia). The PIAT could also be adapted to enable assessment of prospective attachment behaviours in relation to an *existing* significant other, without relying on written questionnaire measures.

2. Therapeutic Alliance-Outcome Association: Research Implications

The present review paper adds to a body of evidence indicating a positive TA-treatment outcome association and is the first to do so among service users with psychosis. This is a pivotal research focus due to the current emphasis on investigating non-specific factors (including TA) within observably equivalent

therapies and the relatively neglected nature of this area within psychosis research. This thesis calls for studies designed specifically to examine the TA-outcome relationship in interventions for psychosis. These should be sufficiently powered to examine the contribution of additional factors such as attachment security and level of paranoia that may shape a TA-to-outcome pathway. Thus, future research could move beyond the observed association, to explore whether TA has a *causal* effect on treatment outcome and the *mechanism(s)* by which this occurs.

3. Therapeutic Alliance-Outcome Association and Attachment Security:

Clinical Implications

The current empirical findings are in line with adult attachment theory, supporting the link between attachment security and how effectively interpersonal relationships are used to regulate negative affect. Together with the review evidence for the TA-outcome association, this has clinical salience. Attachment insecurity is common in psychosis and is associated with poor engagement in routine care. Cognitive behaviour therapy is a National Institute for Health and Care Excellence (NICE)-recommended intervention for psychosis (CBTp). The CBT model conceptualises TA as facilitatory for but secondary to the effect of therapy-specific interventions. Yet, existing CBTp studies show that higher session attendance is only beneficial where TA is strong. Mental health professionals could act on this message by incorporating regular TA assessment into their practice. This strategy is apt because previous evidence and current findings suggest a *crucial* place for TA in psychosis.

4. Therapeutic Alliance-Outcome Association: Implications for Clinical Training

Doctorate in Clinical Psychology training courses could go further to reflect this influential role for the TA in psychosis. The existing metacompetences framework for working with this client group includes the '*ability to judge whether and how to persevere when engagement is threatened by factors characteristic of psychosis*'¹. The current TA-outcome findings suggest that it would be worthwhile for training courses to introduce workshops and role plays with the goal of preparing trainees to navigate these specific challenges to the TA (e.g. clients reporting paranoia about their therapist).

¹ University College London (2018). *Psychological Interventions with People with Psychosis and Bipolar Disorder*. Retrieved from <https://www.ucl.ac.uk/pals/research/clinical-educational-and-health-psychology/research-groups/core/competence-frameworks-10>

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Part 1: Literature Review

Therapeutic alliance and treatment outcome from interventions for psychosis in psychological therapy and routine care contexts: A systematic review and correlational meta-analysis

Abstract

Aim: The therapeutic alliance (TA) is the collaborative, affective bond between client and clinician and is a well-established common factor in the efficacy of psychological interventions. Existing reviews have identified a consistent moderate association between TA and psychotherapy outcome but, historically, service users with a serious mental illness have been overlooked in TA studies. The present review is the first to synthesise the evidence for the TA-outcome association in psychosis, including a range of interventions across psychotherapy and psychiatric care contexts.

Method: A systematic review identified 23 papers that examined the relationship between TA during an intervention and treatment outcomes. Nine papers were synthesised in correlational meta-analyses that investigated TA as associated with change in symptoms.

Results: The Working Alliance Inventory was the most commonly used TA measure, whilst outcome was most often operationalised according to symptomatology. Four correlational meta-analyses identified a significant association between client-rated TA and global ($k = 5$; $r = 0.29$) and psychotic symptoms ($k = 5$; $r = 0.17$) as well as therapist-rated TA and both global ($k = 6$; $r = 0.27$) and psychotic symptoms ($k = 3$; $r = 0.30$). There was promising evidence for higher quality TA and improved social functioning and intervention engagement. TA was not associated with global functioning, internalising symptoms, insight, self-esteem, quality of life or substance use.

Conclusion: To a degree, the TA-outcome association observed among other diagnostic groups in a psychotherapy-only setting was observed among service users with psychosis. This review highlights the considerable heterogeneity of measurement within the field. It concludes by calling for more original research that is statistically powered to investigate the TA-outcome relationship specifically, rather than relying on secondary data analyses.

1. Introduction

1.1. Why investigate the therapeutic alliance in interventions for psychosis?

Therapeutic alliance (TA) is a particularly worthy focus within psychosis outcome research for several reasons. First, qualitative research highlights clearly that service users with psychosis attribute the success of cognitive therapy to their therapist's empathy and trustworthiness (Lawlor, Sharma, Khondoker, Peters, Kuipers & Johns, 2017). Further, they identify a consistent, collaborative and egalitarian relationship with their therapist as the ideal interpersonal context for therapy (Wood, Burke, & Morrison, 2015). Second, engagement difficulties can result in clients receiving only part of therapy which has been associated with reduced efficacy and even detrimental outcomes in Cognitive Behaviour Therapy for psychosis (CBTp) (e.g. Dunn et al., 2012). Third, insecure attachment is common in psychosis (Berry, Barrowclough & Wearden, 2007; Carr, Hardy & Fornells-Ambrojo, 2017; Gumley, Taylor, Schwannauer & MacBeth, 2014) and has been linked to poor engagement with keyworkers in routine care (Berry, Wearden, & Barrowclough, 2007), reduced attachment to services (Blackburn, Berry & Cohen, 2010) and poorer alliance (Berry, Shah, Cook, Geater, Barrowclough & Wearden, 2008; Kvrjic, Beck, Cavelti, Kossowsky, Stieglitz & Vauth 2011).

1.2. Defining therapeutic alliance: A specific 'helping relationship'

Given its salience within interventions for psychosis, it is important to establish a clear understanding of the TA construct. While it can be argued that there is a common 'helping' process that links human relationships and the potential for positive psychological change, there are clear differences between informal support from a loved one and the formal support provided in therapy (Barker & Pistrang, 2002). This *professional* helping relationship or 'TA' can be defined as the

collaborative and affective bond between therapist and client (Martin, Garske, & Davis, 2000) and is thought to be integral to the success of an intervention. Rogers (1957) clearly underscored that the quality of the therapist-client relationship is pivotal to the work of psychotherapy. Specifically, he emphasised that the therapist must: hold unconditional positive regard for the client, develop an empathic understanding of their inner world and strive to communicate this stance in-session. The client must perceive the therapist's regard and understanding as genuine if positive change is to be achieved.

1.3. Plucking the Dodo Bird: Outcome specificity, mechanisms of change and common factors

It is vital that consideration of TA and its role in interventions for psychosis is contextualised within the longstanding debate surrounding the 'Dodo Bird' verdict. This originated with Rosenzweig's (1936) claim that all psychological treatments have equal efficacy. Indeed, given that Barlow (2002) has noted the scope for opposing interpretations of the same treatment efficacy literature, debate regarding the Dodo Bird stance remains ongoing.

1.3.1. Outcome specificity vs. equivalence. There is partial evidence to support a specific effect of psychological treatment depending on the focus of the intervention. These findings that appear to oppose the Dodo Bird verdict come from studies comparing psychological interventions for psychosis against treatment as usual (TAU). In such research, CBTp is superior in terms of reduction of positive symptoms (Zimmermann, Favrod, Trieu, & Pomini, 2005) and family interventions for psychosis reduce risk of relapse (Pharoah, Mari, Rathbone & Wong, 2010), whereas other interventions such as cognitive remediation and social skills training

excel in improving targeted cognitive functioning (McGurk, Twamley, Sitzer, McHugo & Mueser, 2007) or social functioning and negative symptoms (Kurtz & Mueser, 2008), respectively.

The evidence becomes more mixed when the focus shifts to comparing psychological interventions against each other, rather than TAU. In their meta-analysis, Marcus et al. (Marcus, O'Connell, Norris, & Sawaqdeh, 2014) compared the efficacy of a range of treatments and across diagnostic groups. CBT showed a small but significantly superior effect on primary outcome measures, relative to treatments such as interpersonal therapy and psychodynamic therapy. However, it showed comparable efficacy to other behavioural approaches as well as acceptance and commitment therapy on these outcomes. Furthermore, and consistent with a previous comprehensive meta-analysis (Wampold, Mondin, Moody, & Stich, 1997), there were no significant between-therapy differences for secondary outcomes.

As an applied example, CBTp is one of the frontline National Institute for Health and Care Excellence-recommended (2014) psychological therapy for psychosis, and yet, its effect on symptomatology falls to within a small range when sources of potential bias are taken into account (Jauhar, McKenna, Radua & Laws, 2014; Turner, van der Gaag, Karyotaki, & Cuijpers, 2014). Further, although CBTp was developed originally to work with delusional beliefs, it does not show superior efficacy for this positive symptom when compared against other active interventions (e.g. social activity therapy, problem-solving and supportive counselling) (Mehl, Werner, Lincoln, 2015; van der Gaag, Valmaggia & Smit, 2014). Therefore, the data summarised so far shows that the superior impact of a bona fide psychological therapy over no intervention or TAU has been well-established, whereas *'most*

comparative treatment studies find nonsignificant differences' (Luborksy, 1995, p. 106; emphasis added by the current author).

1.3.2. Mechanisms of change and common factors in psychological treatments for psychosis. As a result, there is a current emphasis on identifying theoretically-driven mechanisms of change for observably equivalent therapies as well as acknowledging the potential role of non-specific factors (Meichenbaum & Lilienfeld, 2018). In psychosis specifically, the former focus on specific mechanisms of change has been examined in a series recent randomised controlled trials of CBTp (Freeman et al., 2014 [self-confidence]; Freeman et al., 2015^a [worry]; Freeman et al., 2015^b [sleep]; Freeman et al., 2016 [safety behaviours]; Garety et al., 2014 [reasoning biases]; Morrison et al., 2012 [meta-cognitive appraisals, cognitive insight and beliefs about self and others]). The latter focus on the role of common factors in psychological therapies for psychosis has been neglected comparatively. This is despite findings that indicate the superiority of non-specific psychological interventions such as supportive counselling and befriending when compared against routine care (Sensky et al. 2000; Tarrier et al. 1998). Within this field, TA is the most commonly argued non-specific factor in psychotherapy (Wampold, 2001).

1.4. The role of therapeutic alliance in treatment outcome: Conceptualisation within different interventions

Whilst the broad importance of the TA as a common factor in therapy is well-established, the precise mechanism of its contribution remains contested. The theorised role of alliance and even the language used to describe it varies across modalities. Is it the vehicle that facilitates the intervention, or is it therapeutic in its own right (Catty, 2004)? Table 1 gives an overview of how TA is understood within

Table 1. *The goals and theorised role of the client-therapist alliance across therapeutic modalities*

Therapeutic Modality	Intervention Goal	Conceptualisation of Therapeutic Alliance
Befriending	<ul style="list-style-type: none"> To offer support through friendly discussion on neutral topics and social activities, without explicit symptom focus 	<ul style="list-style-type: none"> Stance of therapist/individual delivering: non-directive, supportive and empathic
CBTp	<ul style="list-style-type: none"> To build up awareness of interaction between thoughts, emotions and behaviours To enhance functioning and ability to cope with symptoms 	<ul style="list-style-type: none"> Engagement in order to build up a collaborative relationship at an early stage is foundational for the intervention Agreement on shared goals of: reducing symptoms, reducing distress and enhancing functioning
Cognitive Remediation Therapy	<ul style="list-style-type: none"> To improve basic cognitive processes such as working memory, attention and executive function to enhance overall functioning 	<ul style="list-style-type: none"> Therapist creates learning environment by offering: positive feedback, encouragement of strategy formation and client-centred tailoring of therapy
Family Intervention	<ul style="list-style-type: none"> To improve the emotional climate of the family who care for the focal client by reducing expressed emotion and establishing reasonable expectations To enhance the family's capacity for problem solving To prevent relapse in symptoms of psychosis 	<ul style="list-style-type: none"> Engagement to build up a collaborative relationship with the family at an early stage is foundational for the intervention
Motivational Interviewing	<ul style="list-style-type: none"> To achieve client behaviour change by exploring and resolving mixed feelings for and against change To build up client's intrinsic motivation for change 	<ul style="list-style-type: none"> Therapeutic alliance is essential to, rather than only creating a favourable context for the intervention Therapist stance: empathic, accepting, genuine, respectful and supportive of client autonomy
Social Skills Training	<ul style="list-style-type: none"> To teach the client how to communicate their emotions and needs effectively To ultimately reduce social distress and enhance social functioning, including their roles and relationships 	<ul style="list-style-type: none"> Therapist and client must agree on context-specific shared interpersonal goals In accordance with behavioural principles, therapist provides positive and corrective feedback (e.g. in role play context and when reviewing homework tasks)
Supportive Counselling	<ul style="list-style-type: none"> To offer the client emotional support 	<ul style="list-style-type: none"> Therapist offers support to the client through the development of their positive relationship Therapist stance: empathic, warm, genuine, accepting and offering unconditional positive regard

Note. Befriending references (Milne, Wharton, James, & Turkington, 2006; Sensky et al., 2000). CBTp (Tarrier et al., 1993; Valmaggia, van der Gaag, Tarrier, Pijnenborg, & Slooff, 2005). Cognitive Remediation Therapy (Huddy, Reeder, Kontis, Wykes, & Stahl, 2012; Wykes et al., 2007). Family Intervention (Pharoah, Mari, Rathbone, & Wong, 2010). Motivational Interviewing (Miller & Rollnick, 2012; Moyers, Miller, & Hendrickson, 2005). Social skills training (Kopelowicz, Liberman, & Zarate, 2006). Supportive Counselling (Tarrier et al., 1998).

different psychological interventions that are commonly applied in the context of psychosis. CBTp and Motivational Interviewing (MI) exemplify this ongoing debate in the field. CBTp casts a positive client-therapist relationship as the essential foundation for the efficacy of cognitive and behavioural techniques. MI identifies the TA as central to the intervention in itself; an empathic, genuine, egalitarian relationship fosters the client to develop intrinsic motivation for behaviour change. Bordin (1979) argued for the pantheoretical nature of TA² and specified three core dimensions: (1) collaboration on relevant tasks, (2) agreement on valued goals, and (3) the trusting, human bond between client and therapist. He posited that, although these dimensions take on a different quality between modalities, they are the mediator for successful therapeutic work (Bordin, 1980).

1.5. Relationship between the therapeutic alliance and treatment outcome:

Synthesising the evidence

1.5.1. Across diagnostic groups. Horvath and Symonds (1991) were the first to conduct a meta-analysis of evidence for the strength of the link between TA and therapy outcome. Martin, Garske and Davis' (2000) meta-analysis replicated their methodology, with a larger updated pool of 79 papers. These reviews identified a similar moderate association between a high quality TA and positive therapy outcome ($r = .26$, Horvath & Symonds, 1991; $r = .22$, Martin, Garske, & Davis, 2000). One notable difference between the two meta-analyses is that only Horvath and Symonds found that client and observer ratings of the alliance offered a better prediction of outcome than therapist reports.

² Therapeutic alliance is used here for consistency, although Bordin used the term working alliance.

Flückiger et al.'s (Flückiger, Del Re, Wampold, Symonds, & Horvath, 2012) meta-analysis took a multi-level longitudinal approach to examine potential moderators of the alliance-outcome association. Their candidate moderators related to research design (e.g. whether a randomised control trial [RCT] design was used), measurement (e.g. at what stage in therapy alliance was assessed) and intervention-specific factors (e.g. whether CBT was examined). Based on their quantitative synthesis of 201 papers up to 2009, they established a moderate association between TA and treatment outcome ($r = .29$). Although there was heterogeneity in the observed effects, the association between alliance and outcome was robust in relation to the majority of the moderator variables.

1.5.2. Within psychiatric treatment. Just as researchers have increasingly examined the relationship between alliance and outcome across therapeutic modalities, attention has turned to whether this association translates from a psychotherapy to a psychiatry context. A descriptive review of case management across a range of mental health conditions (Howgego, Yellowlees, Owen, Meldrum, & Dark, 2003) has restated the positive alliance-outcome correlation but underscored that such research in a community mental health context remains sparse. The authors called for further research in this area.

Priebe and colleagues' (Priebe, Richardson, Cooney, Adedeji, & McCabe, 2011) systematic review of papers between 1990-2009 investigated the alliance-psychiatric outcome (symptoms, hospitalisation rate and functioning) association among clients under community mental health teams. Their vote-count³ analysis

³ Priebe et al. (2011) reported that the heterogeneity of methods across their included papers prevented a meta-analytic approach. Instead, they counted the number of statistically significant effect size estimates in the hypothesised direction and compared this against the frequency of the obtained results using X_2 tests.

strategy identified that the majority of effect sizes supported the link between positive TA and improved treatment outcome, although these effects were small. The authors concluded that a meta-analysis would lack validity due to the heterogeneity in research design across the eligible papers.

Examining TA across psychotherapy *and* psychiatric care is of contemporary interest given potential between-context differences in the nature of alliance. For example, the NICE guidance (2014) for psychosis is that service users should be offered '*a full range of pharmacological, psychological, social, occupational and educational interventions*' that are tailored to their condition. Thus, service users treated under this model may form several different therapeutic relationships with multidisciplinary professionals across a range of interventions. This experience is distinct from the standalone client-psychological therapist dyad that has been the focus of much alliance research to-date. Further, the involvement of a Key Worker or Care Coordinator is specific to community psychiatry. For instance, this relationship can be highly significant when identifying and responding to the early warning signs of relapse (Gumley, O'Grady, McNay, Reilly, Power, & Norrie, 2003). Those under the care of a community treatment team may also experience unique challenges relative to psychotherapy-only clients. For service users with a serious mental illness, these can include high rates of staff turnover (Blackburn, Berry & Cohen, 2010), the potential for treatment under the Mental Health Act (Catty, 2004; Department of Health, 2015) and past negative experiences of the mental health system itself as a threat to their well-being (Hasson-Ohayon, Kravtez, & Lysaker, 2017).

1.6. The present study

Informed by the existing evidence base, the present review set out to synthesise research that investigates whether TA is predictive of outcome across interventions for service users with psychosis. It is the first review to examine alliance between participants experiencing psychosis and any healthcare professional (regardless of intervention type) in relation to treatment outcome. This focus is further justified because the scope of previous reviews ends after 2009 (Flückiger et al., 2012). Given that the TA is a common factor in therapy and of continued interest in treatment process research, an updated review is warranted.

1.6.1. Aims. This systematic review aimed to identify relevant studies, critically evaluate their methodological approach, summarise their key findings and synthesise them quantitatively where possible. Specifically, it aimed to examine the relationship between TA at 'time 1' and outcome at a subsequent 'time 2' (during the intervention, at the end of the intervention or at a pre-specified follow-up time after treatment completion).

2. Methods

2.1. Eligibility criteria

Inclusion criteria were articles that included:

- i) Participants with either an affective or non-affective psychotic diagnosis (bipolar disorder was considered an eligible diagnosis). Participants were eligible if they had this as their primary diagnosis.
- ii) Participants aged 16 years and above, with no upper age limit. The lower age limit was selected to include participants who would be seen within

Early Intervention in Psychosis (EIP) NHS services whilst also preserving an adult rather than child population.

- iii) Assessment of a therapeutic intervention- this criterion was deliberately broad to encompass traditional psychological therapy and well as the relationships built with healthcare professionals in the context of routine care (e.g. community psychiatry, case management or care coordination). The intervention modality and format were also left open, for example, including individual, family or group therapy.
- iv) A quantitative measure of TA- this measure could have been client, clinician or observer-rated.
- v) A quantitative measure of therapeutic outcome- this criterion was intended to capture outcome according to the symptoms of psychosis, as well as more wide-ranging dimensions (e.g. service user well-being, social engagement, global functioning, activity levels, etc.).
- vi) It was stipulated that eligible papers must assess alliance at one time-point (T1) and outcome at a later time-point (T2). As stated above, it was required that T2 was after assessment of alliance but this could have been during the intervention, at the end of the intervention or at a pre-specified follow-up time after treatment completion.
- vii) Assessment of outcome at pre- and post-intervention as a minimum in the study design; the inclusion of a control group was not an essential criterion.
- viii) An English language study in a peer-reviewed journal.

Exclusion criteria were articles that:

- i) Studied a sample of participants who had a range diagnoses, without disaggregating results for a psychosis group specifically. For example, some ineligible studies applied an umbrella term such as serious mental illness (e.g. schizophrenia, bipolar disorder and personality disorder) and analysed all diagnostic groups together.
- ii) Used medication adherence as the sole intervention outcome measure.
- iii) Included quantitative assessment of TA as an outcome variable only (rather than as a predictor variable).
- iv) Assessed TA between family members/significant others and the therapist, without also assessing service user-therapist alliance.
- v) Assessed an intervention delivered by a computer-programmed system without ongoing healthcare professional input.

2.2. Search strategy

Informed by existing meta-analyses within the field, a four-step method was applied to search the literature. First, computerised databases were searched for articles that were eligible according to the inclusion and exclusion criteria. The final search included PubMed, PsycInfo and EMBASE across the time span from each database's start-date, up to and including July 31st 2017. The search terms are outlined in Table 2 (final database-specific searches are detailed in Appendix 1).

Second, a hand search of journals that are pertinent to the subject matter was conducted to cover January 2016 up to and including July 31st 2017. Journals were selected according to the titles that were screened by Martin and colleagues (2000) in their meta-analysis of the relationship between TA and outcome across diagnostic

categories: American Journal of Psychiatry, Archives of General Psychiatry, The Counseling Psychologist, Journal of Consulting and Clinical Psychology, Journal of Counseling Psychology, Journal of Nervous and Mental Disease, Psychotherapy, Psychotherapy Research and Professional Psychology: Research and Practice. The hand search was extended to the following journals to reflect the specific research questions of the current review: Psychosis: Psychological, Social and Integrative Approaches, Schizophrenia Research, Schizophrenia Bulletin, Cognitive and Behavioural Psychotherapy and Journal of Clinical Psychology.

Third, the reference list of papers known to be eligible for inclusion in the review were searched for additional studies. Fourth, the key search terms were entered into Google Scholar. All search results were then imported into an EndNote (Version 7) library, after which duplicates were identified and deleted.

Table 2. Search terms used to for review of computerised databases

Diagnosis	Psychological Intervention	Therapeutic Alliance
	AND	AND
Psychos?s	Therap*	Alliance
Psychotic*	Intervention*	Therap* relationship
Schizo*	Psychotherap*	Therap* bond
Paranoi*	Mindfulness	
Persecutory delusion*	CBT	

Note. Search terms organised such that rows denote the Boolean operator 'OR' and columns denote 'AND' within the final database search.

Participant age is not represented by specific search terms due to inclusion criterion i). Participants aged 16 years and above were of interest, thus, search terms such as 'adult' or 'adolescent' were unlikely to enhance the researcher's ability to identify eligible studies.

Given the breadth of criterion iii) the 'Psychological Intervention' column was designed to be inclusive. Other well-established acronyms were trialled (e.g. ACT, DBT, MBT, BA, CT and MBCT) however, only CBT added to the number of studies captured by the search.

Searches were trialled with a column for 'Treatment Outcome'. As criterion v) aimed to capture a range of definition of treatment outcome, it was felt that this additional search component would risk excessive specificity.

2.3. Assessment of methodological quality

The National Institutes of Health (NIH; 2014) quality assessment tool for before-after (pre-post) studies with no control group was used to guide the assessment of each study's methodological quality and risk of bias (see Appendix 2). This rating scale was well-suited to the current research question, given the review's focus on the association between early alliance and outcome at follow-up rather than a between-group comparison. This NIH tool was also appropriate because it taps into comprehensive indicators of methodological quality, from research question through to statistical reporting. The scale was designed to guide researchers to examine the areas that underpin a study's internal validity, rather than generating a total score. Therefore, the collective methodological quality of the final papers is summarised according to each assessment dimension in Section 3.2.

Some adaptations were made to this NIH tool to maximise its relevance to the current review. In the original version, papers are rated on each item as: 'yes', 'no', 'cannot determine', 'not reported' or 'not applicable'. It was felt that a 3-point 0-2 (low to high) scale would enable more nuanced quality assessment than the binary yes-no format. In addition, one item was omitted because it relates to whether statistical analysis of group-level interventions accounts for the use of individual-level data. As the present eligibility criteria were open to including a range of intervention formats and one-to-one therapeutic relationships are most common in the existing alliance literature, this item would not offer an important basis for between-paper comparison.

One item in the NIH tool relates to the measures used in a study. This was subdivided for the present review to characterise the quality of both the alliance and outcome measures. Specifically, it was noted whether the chosen tools were

psychometrically-supported in the literature and if any member of the research group had been involved in designing the measure as a potential source of bias (risk of researcher allegiance identified by Flückiger et al., 2012).

An item was introduced to capture whether each paper was designed to assess the relationship between alliance and outcome specifically. This characteristic is important because alliance is often assessed within therapy trials as a statistical control for common factors. In such studies where alliance is not central to the research questions, there could be a risk that analyses relevant to the current review were under-powered. Further, the role of TA could be underestimated due to researchers' allegiance to finding evidence for a specific treatment effect over and above the contribution of non-specific factors (Luborksy, 1995; Marcus et al., 2014; Turner et al., 2014). This new item, together with the existing NIH item that examined whether assessors were blind to intervention condition, was designed to capture any such risk of researcher bias.

Finally, the item about quality of statistical reporting was expanded to include whether each paper reported both significant and non-significant findings, in addition to the existing reference to reporting p values. Such complete reporting was important in light of the planned meta-analytic approach.

2.4. Assessment of association between therapeutic alliance and outcome

Effect sizes for the association between TA and outcome were extracted between two time points. The earliest available alliance measure was extracted along with the specific outcome variable from the T2 wave of data collection. If there were multiple follow-up waves, the outcome from the final time-point that was included in the paper's analysis was extracted. Statistical analyses were carried out with the R

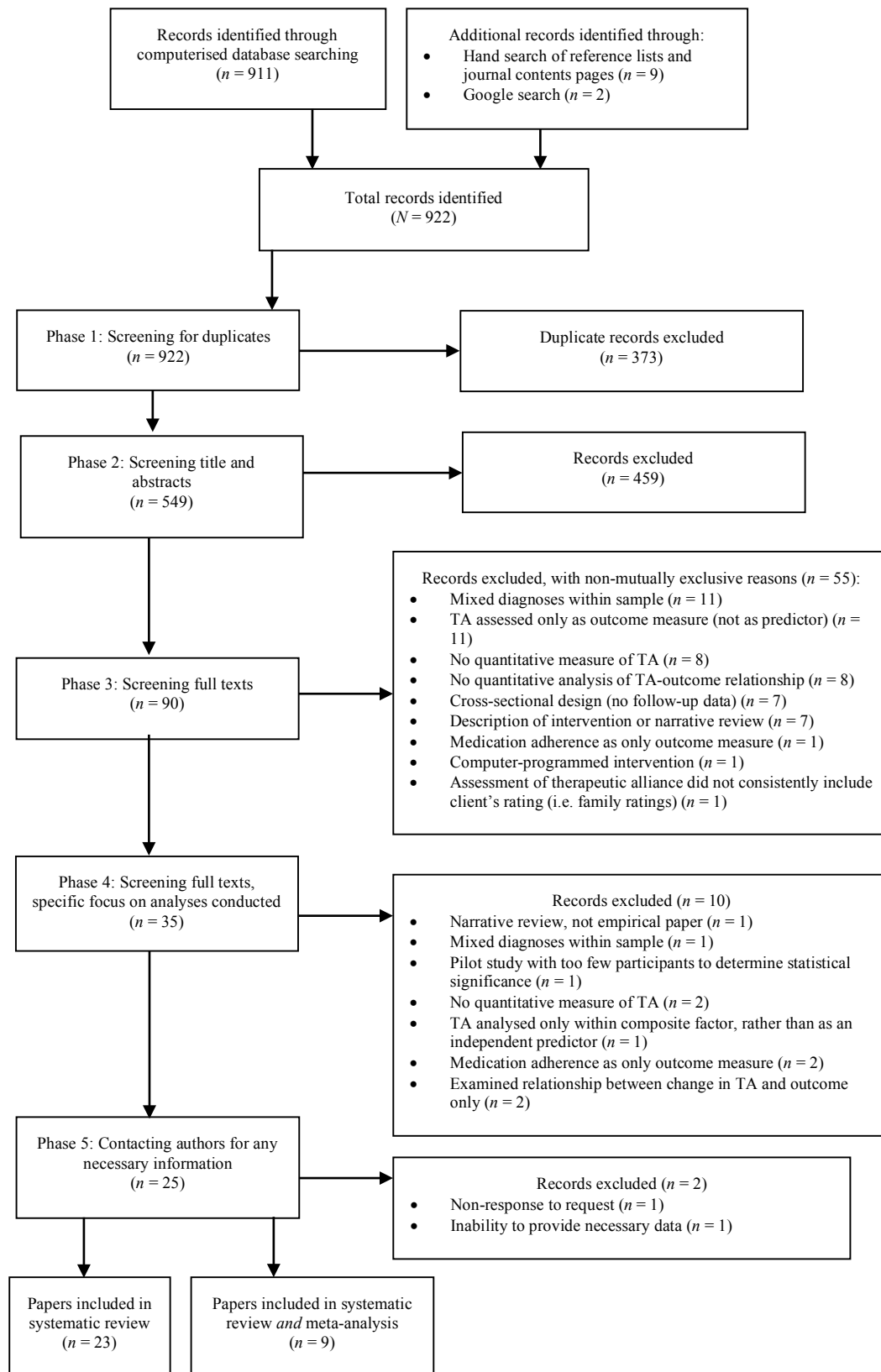
software (Version 3.4.2), using the metafor package (Viechtbauer, 2010). The meta-analytic model weighted the effect size from each paper based on sample size.

3. Results

The PRISMA diagram (Figure 1) details the break-down of papers identified during each part of the search strategy. After excluding duplicate records, the first pass of screening titles and abstracts was conducted for 549 papers, using the inclusion and exclusion criteria as a guide. A conservative approach was implemented at this stage because measures of TA were often included in studies as a secondary variable of interest (e.g. in trials of psychological interventions) and thus, not described in detail in the abstract. A closer review narrowed the set of papers down to 35 that needed to be assessed thoroughly in their full-text format. Before determining the final papers, it was necessary to contact corresponding authors to request additional information about their methodology and/or statistical analysis (13 out of 25 papers). Six authors, representing eight papers provided the necessary information. Any papers where no further clarification was received within a 1-month deadline were excluded from the current review.

Ultimately, 23 papers were included in this systematic review. Nine of these were included in the further meta-analytic stage. This subset was characterised by sufficient methodological and statistical commonality to make quantitative synthesis meaningful. A correlational meta-analysis was conducted to investigate the overall strength of the association between early TA and change in symptomatology over time. T1-T2 change was the most common approach to operationalising outcome among the eligible papers. Further, applying change scores rather than raw scores

Figure 1. PRISMA flow-chart of article selection process



has been identified as an indicator of methodological quality if any TA-to-outcome direction of effect is to be ventured (Constantino et al., 2017; NIH, 2014).

3.1. Included studies

The final papers for the systematic review were published between 1976-2016. All but one paper reported findings from a single study; Reininghaus and colleagues (2013) conducted an analysis of data pooled across two RCTs. Collectively, the 23 papers represent international samples within the Western world, with data from: the United Kingdom ($n = 12$), United States of America ($n = 5$), The Netherlands ($n = 3$), Switzerland ($n = 3$), Canada ($n = 2$) and Germany ($n = 2$). Australia, Bulgaria, Italy, Spain and Sweden were each represented by one study. The key characteristics for the studies that examine TA in the context of psychological therapy interventions are detailed in Table 3. Characteristics of the routine care intervention studies are detailed in Table 4.

3.1.1. Participants characteristics and study setting. The final papers represent data collected from 4,169 participants living with a psychotic diagnosis. All participants were at least 16 years old, with an overall average age of 35.4. Some recruited participants with non-affective psychosis only (e.g. Goldsmith et al., 2015), others focused on those who were living with a dual diagnosis (e.g. psychosis and a substance use disorder, Berry et al., 2015) and others looked exclusively at participants in a particular phase of their condition (e.g. Lecomte et al., 2012; early psychosis).

Ten papers assessed participants who were under the care of a community mental health team, with a further two recruiting from outpatient clinics. Six papers recruited participants from an in-patient or day unit setting. Participants from four

Table 3. *Included studies examining therapeutic alliance in the context of a psychological therapy intervention (n = 14)*

Authors (Year) Country	N	Participant Profile	Intervention (Duration)	Measure of Therapeutic Alliance	Who assessed TA (When)	Follow-up	Outcome Measures
Andrews et al. (2016) Australia	178	Psychotic disorder Smoker	'Healthy Lifestyles Intervention' (16 sessions)	Agnew Relationship Measure	Client and therapist (After Session 1)	Mid-intervention (15 weeks) Post-intervention (3 months)	Global symptoms Health behaviours Retention in therapy
Berry et al. (2015) UK	164	16 years+ Non-affective psychosis Substance dependence/abuse	MI and CBT (12 months, 26 sessions)	Working Alliance Inventory	Client and therapist (After Session 3)	End of intervention (12 months)	Psychotic symptoms Global functioning Substance use
Berry et al. (2016) UK	75	16-35 years Non-affective psychosis Under EIP team Cannabis dependence/abuse	MI and CBT 'Brief' (4.5 months, 12 sessions) 'Longer-term' (9 months, up to 24 sessions)	Working Alliance Inventory: Short form	Client and therapist (1 month into therapy)	End of brief intervention (4.5 months) End of longer-term intervention (9 months) Post-intervention (13.5 or 9 months)	Symptoms Retention in therapy Global functioning Substance use
Davis & Lysaker (2007) USA	26	Schizophrenia or schizoaffective disorder Under VA medical centre	Individual/group CBT-informed counselling within vocational rehabilitation programme (Up to 6 months)	Working Alliance Inventory: Short form	Observer- using videotaped session (Halfway through therapy)	Mid-intervention (Weeks 11 and 23)	Social skills Cooperativeness Work quality Work habits Personal presentation
Dunn et al. (2006) UK	29	Schizophrenia spectrum disorder Completed course of therapy	CBTp (no. sessions varied 4-35")	California Psychotherapy Alliance Scale	Client (After Session 3)	Mid-intervention (Session 9)	Psychotic symptoms Homework compliance
Frank & Gunderson (1990) USA	143	18-35 years Non-chronic schizophrenia No history of substance dependency	Individual psychotherapy [#] (Up to 2 years)	Psychotherapy Status Report	Therapist (After 6 months)	End of therapy or post-intervention, depending on length of individual psychotherapy (24 months)	Symptoms Length of retention in therapy Rehospitalisation rates

Table 3 (Continued). *Included studies examining therapeutic alliance in the context of a psychological therapy intervention (n = 14)*

Authors (Year) Country	N	Participant Profile	Intervention (Duration)	Measure of Therapeutic Alliance	Who assessed TA (When)	Follow-up	Outcome Measures
Goldsmith et al. (2015) UK	207	Non-affective psychosis (1 st /2 nd episode)	CBT or Supportive Counselling (6 weekly sessions + 2 booster sessions)	California Psychotherapy Alliance Scale	Client (Session 4)	Post-intervention (6.5 months)	Psychotic symptoms
Huddy et al. (2012) UK	49	Schizophrenia	Cognitive Remediation Therapy (3 months, 40 sessions, at least 3 days per week)	Working Alliance Inventory: Short form	Client and therapist (Before Session 4)	End of intervention (3 months)	Working memory Target complaints Self-esteem
Johnson et al. (2008) USA	58	Schizophrenia or schizoaffective disorder Auditory hallucinations (at least moderate severity)	Group CBT or Group Supportive Therapy (12 weekly sessions)	Working Alliance Inventory: Group alliance version	Client (Session 6)	End of intervention (3 months)	Therapy participation Therapy attendance
Lecomte, Laferrière- Simard, & Leclerc (2012) Canada	36	18-35 years Early psychosis* Completed pre- and post- intervention assessments Completed at least two therapeutic alliance measures	Group CBTp or group skills training for symptom management in early psychosis (3 months, up to 24 sessions, twice weekly)	Working Alliance Inventory: Short form	Client and therapist (Averaged over 1 st month of therapy)	Mid-intervention (monthly) End of intervention (3 months)	Overall symptoms Percentage of sessions attended Participation in sessions Self-esteem Insight
Lecomte et al. (2015) Canada	66	Early psychosis Medication-resistant symptoms Under FEP programme	Group CBTp (24 sessions)	Working Alliance Inventory: Short form QuickLL: Alliance	Client and group co-therapists (Averaged over 1 st month of therapy) Client (Averaged over 1 st month of therapy)	End of intervention (3 months) Post-intervention (9 months)	Global symptoms Positive psychotic symptoms Self-esteem

Table 3. (Continued) *Included studies examining therapeutic alliance in the context of a psychological therapy intervention (n = 14)*

Authors (Year) Country	N	Participant Profile	Intervention (Duration)	Measure of Therapeutic Alliance	Who assessed TA (When)	Follow-up	Outcome Measures
Mulligan et al. (2014) UK	21	Working age Non-affective psychosis	Telephone-delivered CBTp with two face-to-face sessions (9 months)	Working Alliance Inventory: Short form	Client and therapist (After Session 3)	End of intervention (9 months)	Therapist perception of change due to therapy Number of sessions missed Level of formulation achieved
Staring, Gaag, & Mulder (2011) Netherlands	103	Schizophrenia spectrum disorder Problems with service engagement	Treatment Adherence Therapy (6 months, flexible no. sessions)	Working Alliance Inventory: Full form	Client in relation to their alliance with their regular clinician (not TAT therapist) (At baseline [†])	End of intervention (6 months) Post-intervention (12 months)	Remission of psychotic symptoms
Startup et al. (2006) UK	29	Schizophrenia or schizoaffective disorder	CBT for acute psychosis (Up to 25 sessions)	Active Engagement Scale Working Alliance Inventory	Therapist (after each session but sample of sessions selected to represent full course of treatment) Observer- using session recordings (as above)	End of intervention (6 months)	Retention in psychological treatment

[†]EIP[†] = Early Intervention in Psychosis team. [†]VA[†] = Veterans' Association. FEP = first episode in psychosis programme.

[†]In Dunn et al. (2006) mean no. sessions attended = 17.8 (SD = 8.1). ^{*}< 2 years since first consultation for psychotic episode. [#]Individual psychotherapy = either Exploratory Insight Oriented or Reality-Adaptive-Supportive therapy. [†]Treatment Adherence Therapy = four modules including behavioural and motivational interviewing techniques. [‡]At baseline = relationship with existing clinician so varied prior experience of working with them.

Table 4. *Included studies examining therapeutic alliance in the context of a therapeutic relationship as part of routine care (n = 9)*

Authors (Year) Country	N	Participant Profile	Intervention (Duration)	Measure of Therapeutic Alliance	Who assessed TA (When)	Follow-up	Outcome Measures
Berry & Greenwood (2015) UK	51	18-36 years Psychotic disorder Under EIP team	Relationship with lead clinician (working together for at least 3 months at baseline + 5 months)	Working Alliance Inventory: Short form- The Perceived Expressed Emotion in Staff Scale The Adjective Checklist	Client and clinician (At baseline- variable depending on length of ongoing relationship) Client (as above) Clinician (as above)	Post-baseline (5 months)	Vocational activity Community belonging Social activity Client hopefulness
Catty et al. (2010) UK, Switzerland, Bulgaria, Netherlands, Italy, Germany	312	18 years-Retirement age Psychotic disorder Desire to enter competitive employment but unable to do so over previous year	Clinical Key Worker and Vocational Key Worker (Up to 18 months)	Helping Alliance Scale	Client and Clinical Key Worker (At baseline) Vocational Key Worker (6 months post- baseline)	Mid-intervention (6 and 12 months) End of intervention (18 months)	Remission Hospitalisation Psychotic symptoms Global functioning Social disability Quality of life Self-esteem Vocational outcomes
Cavelti, Homan, & Vauth (2016) Switzerland	133	18-65 years, Schizophrenia or schizoaffective disorder Under community mental health services	Community Psychiatry (Variable as part of routine care)	STAR-P and STAR-C	Client and Key Clinician (At baseline)	Post-baseline (12 months)	Personal recovery: Integration- Sealing over style Willingness to ask for help Client Perception of feeling dominated by their symptoms

Table 4 (Continued). *Included studies examining therapeutic alliance in the context of a therapeutic relationship as part of routine care (n = 9)*

Authors (Year) Country	N	Participant Profile	Intervention (Duration)	Measure of Therapeutic Alliance	Who assessed TA (When)	Follow-up	Outcome Measures
Farrelly et al. (2014) UK	569	16 years+ Relapsing psychotic disorder	Care coordinator-client relationship (Variable as part of routine care)	Working Alliance Inventory: Short form and version adapted for community settings	Client and care coordinator (At baseline)	Post-baseline (18 months)	Global functioning Readmission rates Harm to self or others
Kayton, Beck, & Soon (1976) USA	30	Young adults* Schizophrenia Admitted to inpatient medical centre	Within routine care relationship with team (Variable as part of routine care)	Dichotomous rating of whether a good therapeutic relationship was 'absent' or 'present'	Observer (End of intervention)	Post-intervention (annually for 2-3 years)	Social and vocational adjustment
Novick et al. (2015) Germany, Greece and France	903	Schizophrenia or bipolar disorder Outpatient Prescribed antipsychotic medication in last 45 days	Work with psychiatrist re. medication (Variable as part of routine care)	Working Alliance Inventory: Full form	Clinician (At baseline)	Post-baseline (1 year)	Global functioning, Insight
Olfson et al. (1999) USA	262	18-64 years Schizophrenia or schizoaffective disorder Inpatient admission Medicaid recipients	In-patient admission under MDT (Variable according to length of admission)	Active Engagement Scale	Lead Clinician/ team as whole (End of intervention)	Post-intervention (3 months)	Readmission rates
Reininghaus et al., (2013) UK, Spain, Netherlands, Switzerland, Sweden, Germany	605	Psychotic disorder	CMHT care: FOCUS Trial (Variable as part of routine care) CMHT care plus computer mediated intervention: DIALOG Trial (Every 2 months for up to 2 years)	Helping Alliance Scale	Client and Clinician (At baseline)	Post-baseline: FOCUS Trial (7 months) End of intervention: DIALOG Trial (12 months)	Number of days rehospitalised

Table 4 (Continued). *Included studies examining therapeutic alliance in the context of a therapeutic relationship as part of routine care (n = 9)*

Authors (Year) Country	N	Participant Profile	Intervention (Duration)	Measure of Therapeutic Alliance	Who assessed TA (When)	Follow-up	Outcome Measures
Tattan and Tarrier (2000) UK	120	18-65 years Severe psychotic disorder At least two previous in- patient admissions	Case Management (Up to 2 years)	Five Minute Speech Sample-	Clinician (At baseline, at least 3 months after start of relationship)	Post-baseline (6 and 9 months)	Symptoms Satisfaction with care Social disability Quality of life, Readmission rates Number of days in hospital Retention in treatment

Note. The 'Follow-up' column is reported differently for the routine care papers in this table, as compared with the psychological intervention papers in Table 3; most of these papers did not have a formal intervention start date because they studied client-clinician alliance in routine care. To make this distinction clear, the timeframe for follow-up assessment of outcome is described as 'post-baseline' rather than 'post' or 'mid-intervention'.

**Young adults' i.e. age range of participants =18-36 years.

papers were being treated by an EIP team. A final study recruited from a Veterans Association medical centre. Participants in some studies started working with their key clinician as an inpatient but therapeutic contact continued post-discharge (e.g. Frank & Gunderson, 1990).

3.1.2. Intervention type. As outlined in the eligibility criteria, a broad definition of therapeutic intervention was set in this review. Consequently, the final papers can be divided into those that assessed TA in the context of psychological therapy in ($n = 14$) and routine care ($n = 9$).

The psychological interventions were diverse, with CBTp as the most common ($n = 4$). One of these papers examined a telephone-delivered adaptation of CBTp (Mulligan et al., 2014). Two papers investigated an MI plus CBT intervention (Berry et al., 2015; Berry et al., 2016). In relation to the MI component, the target behaviour change was identified as either substance misuse in general (Berry et al., 2015) or cannabis use specifically (Berry et al., 2016). Cognitive remediation therapy (Huddy et al., 2012), treatment adherence therapy (TAT, a combination of behavioural and MI techniques; Staring et al., 2011) and psychotherapy (exploratory insight-oriented or reality-adaptive-supportive therapy; Frank & Gunderson, 1990) were each represented by one paper. All but one of these psychological therapy papers tested a manualised intervention: Staring and colleagues' (2011) TAT was guided by therapy modules outlined in an intervention proposal paper.

Andrews et al. (2016) and Lecomte et al. (2012) both studied TA in two different intervention conditions. The condition conceptualised as the active psychological intervention was selected here to ensure consistency with the other psychotherapy papers in the review. These interventions were a novel 'Healthy Lifestyles Intervention' (CBT and contingent reinforcement techniques with

increasing health behaviours as the primary treatment goal) and CBTp, respectively. It was hoped that this decision would increase the clarity of these papers' contribution to the qualitative and quantitative synthesis.

Two remaining papers assessed the alliance-outcome relationship in psychological therapy across CBT and supportive counselling treatment groups (Goldsmith et al., 2015; Johnson et al., 2008). Overall, ten of these 14 psychological therapy-focused papers featured a one-to-one intervention, three featured a group intervention and one combined individual and group interventions conditions in its analysis.

The nine papers that explored the TA-outcome relationship within routine care also reflect a range of intervention formats. The most represented therapeutic intervention was the relationship between the client and their key community psychiatry clinician ($n = 6$), typically their identified Care Coordinator. One of these studies examined the impact of a computer-mediated intervention designed to enhance client-clinician dialogue in the context of this relationship (Reininghaus et al., 2013; DIALOG study data). Another explored the importance of parallel intervention by a Vocational Key Worker in an employment support programme (Catty et al., 2010). A single routine care paper focused on a case management approach (Tattan & Tarrier, 2000). The final two papers studied the working relationship within an in-patient or day centre multi-disciplinary team (MDT) setting. Therefore, the latter papers varied in terms of which clinician was identified as the source of therapeutic intervention (the key clinician, Olfson et al., 1999; the team healthcare professional chosen by the client, Kayton et al., 1976).

3.1.3. Length of intervention. Among the psychological therapy intervention papers, the number of sessions offered ranged from 8-40. One of these

(Berry et al., 2016) analysed aggregated data across participants from a brief (12 sessions) and longer-term intervention format (24 sessions).

Four papers specified a timeframe in months for the therapy dose rather than the number of sessions offered. In two of these, 6 months of sessions were available depending on length of the client's work placement (Davis & Lysaker, 2007) or number of indicated therapy modules (Staring et al., 2011). Mulligan and colleagues' (2014) CBTp intervention was offered over 9 months. The authors pooled the data across two active psychological intervention conditions: a low support group who could access up to 30 sessions of telephone-delivered CBTp and a high support group who were offered these, plus group sessions. Frank and Gunderson's (1990) study offered therapy for up to 2 years; the longest timeframe among the psychological therapy papers.

Seven of the nine routine care papers recruited service users who were under the care of a clinical team before the start of the study. Consequently, it is difficult to ascertain the duration of these therapeutic relationships. However, two of these papers specified that clients had been under their team for at least 3 months pre-baseline (Renninghaus et al., 2013 [both trials]; Tattan & Tarrier, 2000;). Catty et al. (2010) examined an open-ended employment support intervention offered for up to 18 months. In Olsson et al.'s (1999) study that recruited an inpatient sample, the mean length of intervention (i.e. admission) was 28.5 days.

3.1.4. Length of follow-up. There were various timings of follow-up assessment(s) across the final studies. Seven papers evaluated outcome mid-intervention. Some of these timed the assessment according to session number (e.g. Dunn et al., 2006; Session 9), while others conducted it after a certain amount of time post-baseline (e.g. Catty et al., 2010; 6 and 12 months into the intervention).

Eleven papers assessed outcome at the end of the intervention, whose lengths ranged between 3-24 months. Thirteen papers conducted the follow-up assessment of outcome post-intervention (also with a range of 3-24 months post-treatment).

Two papers timed follow-up assessment of their dependent variables using time from discharge rather than from baseline (annually for up to 3 years post-discharge, Kayton et al., 1976; 3 months post-discharge, Olfson et al., 1999). Finally, as Reininghaus and colleagues (2013) conducted a pooled analysis across two trials, their outcome assessments were not all administered at the same time (DIALOG trial = 12 months post-baseline [end of intervention]; FOCUS trial = 7 months post-baseline).

3.1.5. Assessment of alliance.

Range of measures. Eleven different measures of TA were used within the included papers. These will be summarised briefly here, given that a comprehensive review across the range of alliance assessment tools is already available (Elvins & Green, 2008). The Working Alliance Inventory (WAI; Horvath and Greenberg, 1989) was the most commonly used tool ($n = 13$; either full 36-item or short form 12-item format). The WAI is informed by Bordin's (1979) pantheoretical definition of the alliance construct.

There was substantial diversity in the alliance measures used in the remaining papers. Three studies used the Psychotherapy Status Report (Stanton et al., 1984) or the Active Engagement Scale (combination of scores from the PSR), while the California Psychotherapy Status Report (CALPAS; Marmar, Weiss, & Gaston, 1989) was used in two. The CALPAS distinguishes between working alliance and the TA as two distinct constructs (Gaston, 1991).

There was no commonality in measurement approach between the remaining papers. The Quick LL (Lecomte, Spidel, & Leclerc, 2005), Agnew Relationship Measure (Agnew-Davies et al., 1998), the Perceived Expressed Emotion in Staff Scale (PEESS; Forster et al., 2003), the Five-Minute Speech Sample (Magaña et al., 1986), the Adjective Checklist (Friedmann & Goldstein, 1993), the Scale to Assess the Therapeutic Relationship (STAR) in community mental health care (McGuire-Snieckus, McCabe, Catty, & Priebe, 2007) and the Helping Alliance Scale (HAS; Priebe & Gruyters, 1993) were all applied by one of the final papers to assess alliance. The latter STAR and HAS were designed to assess alliance in a community psychiatry context specifically. A single paper (Kayton, Beck, & Soon, 1976) did not use a formal measure, but rather gave a 'present-absent' dichotomous rating of alliance. Three papers chose to use more than one measure of TA (Berry & Greenwood, 2015; Lecomte et al., 2015; Startup et al., 2006).

Respondent. Most papers looked to the therapist or another clinician as an informant about the quality of the alliance ($n = 17$). Sixteen obtained this information from the client themselves. Three papers reported using an observer-rated measure of TA. Some papers gathered information about the alliance from more than one informant ($n = 14$), of which 12 consulted both client and clinician. This attention to how both members of the therapeutic dyad evaluate the TA has been identified as particularly important when investigating the relationship between the alliance and treatment outcome (Kivlighan Jr., 2007).

When alliance was assessed. Given that the TA develops as the client and clinician work together over time, it is important to attend to the stage in the work when the quality of the relationship was assessed. Seven papers reported assessing TA at baseline in the context of routine care. This means that the length of time that

the client and clinician had already been working together will have varied and was typically not reported. As reported above, two of these papers specified that clients had been under known to their team for at least 3 months pre-baseline (Renninghaus et al., 2013 [both trials]; Tattan & TARRIER, 2000;). Catty et al. (2010) explored the impact of the pre-existing alliance between client and their Clinical Key Worker at baseline as well as TA with a new Vocational Key Worker 6 months later.

Most studies reported assessing alliance at a particular stage in the intervention: after Session 1 ($n = 1$), after Session 3 ($n = 4$), at Session 4 ($n = 1$), 1 month into the intervention ($n = 3$; Lecomte et al., 2015, at the halfway point ($n = 2$), 6 months into the intervention ($n = 2$). The timing of the alliance measurement was approached differently in inpatient studies; both collected this data at the point of discharge. In contrast to the other papers, Startup et al. (2006) selected a sample of therapy recordings to assess alliance *across* sessions.

3.1.6. Assessment of outcome. As with the assessment of TA, there was a large range of measures used to track the outcome of therapeutic intervention. Indeed, over 30 different indices of client outcome were identified across the final set of studies.

Outcome measures used. Tables 5 and 6 provide a full breakdown of outcome measures by paper. For clarity, only those measures that were used in at least two papers are summarised here. In line with the breadth of the eligibility criteria, these include symptomatology, substance use, hospitalisation, therapy engagement and the client's subjective view of recovery.

Psychiatric symptoms. Fifteen papers examined psychiatric symptoms at a T2. Nine of these took a general approach to symptomatology using: the Brief Psychiatric Rating Scale (BPRS; Ventura et al., 2000), the Comprehensive

Table 5. Summary of outcome measures assessed at follow-up in psychological therapy intervention papers (n = 14)

Author (Year)	Psychiatric Symptoms			Functioning			Substance Use		Hospitalisation			Therapy Engagement				Self-Esteem			
	Overall	Psychosis	Depression	Depression & Anxiety	Insight	Global	Social skills	Social participation	Overall	% reduction in cannabis use	Risk of readmission	Time in psychiatric hospital	No. sessions attended	% sessions missed	No. sessions missed	Completing vs. not completing therapy	Low vs. high therapy attendance	Participation	Overall
Andrews et al. (2016)	+ (C) ns (T)	-	ns (C) ns (T)	-	-	ns (C) ns (T)	-	-	-	-	-	-	-	-	-	-	ns (C) ns (T)	-	-
Berry et al. (2015)	-	ns (C) +	-	-	-	ns (C) ns (T)	-	-	ns (C) +	-	-	-	-	-	-	-	-	-	-
Berry et al. (2016)	-	+ (C) ns (T)	-	-	-	+ (C) ns (T)	-	-	ns (C) ns (T)	ns (C) ns (T)	-	-	ns (C) +	-	+	(T)	-	-	-
Davis & Lysaker (2007)	-	-	-	-	-	-	ns (O)	-	-	-	-	-	-	-	-	-	-	-	-
Dunn et al. (2006)	-	ns (C)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Frank & Gunderson (1990)	+ (T)	+ (T)	-	ns (T)	+ (T)	-	+ (T)	+ (T)	-	-	+ (T)	ns (T)	-	-	-	+	(T)	-	-
Goldsmith et al. (2015)	-	+/- (C)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Huddy et al. (2012)	+ (C) ns (T)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ns (C) ns (T)

Table 5 (Continued). *Summary of outcome measures assessed at follow-up in psychological therapy intervention papers (n = 14)*

Author (Year)	Psychiatric Symptoms					Functioning			Substance Use		Hospitalisation		Therapy Engagement				Self-Esteem	
	Overall	Psychosis	Depression	Depression & Anxiety	Insight	Global	Social skills	Social participation	Overall	% reduction in cannabis use	Risk of readmission	Time in psychiatric hospital	No. sessions attended	% sessions attended	No. sessions missed	Completing vs. not completing therapy	Low vs. high therapy attendance	Participation
Johnson et al. (2008)	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	-
													(C)	(C)			(C)	
Lecomte et al. (2012)	ns	-	-	-	ns	-	-	-	-	-	-	-	+	-	-	-	+	+
	(C)				(C)								(C)				(C)	(C)
	ns				ns								+				+	ns
	(T)				(T)								(T)				(T)	(T)
Lecomte et al. (2015)	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	(C)	(C)																
	ns	ns																
	(T)	(T)																
Mulligan et al. (2014)	ns	-	-	-	-	-	-	-	-	-	-	-	-	ns	-	-	-	-
	(C)													(C)				
	+													+				
	(T)													(T)				
Staring, Gaag, & Mulder (2011)	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	(C)																	
Startup et al. (2006)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-
															(T)			
															ns			
															(O)			

Note. Letter in brackets denotes the informant for therapeutic alliance: (C) = Client, (T) = Therapist/Clinician, (O) = Observer. '+' = significant relationship between alliance and outcome, such that better alliance quality relates to improved clinical outcome. 'ns' = no significant relationship between alliance and outcome. +/- = specific to Goldsmith et al.'s analytic approach, indicating a *contingent* effect of alliance on outcome.

Grey columns denote the outcomes where there was sufficient commonality between analyses for the data to be synthesised using meta-analyses.

Table 6. Summary of outcome measures assessed at follow-up routine care intervention papers (n = 9)

Author (Year)	Psychiatric Symptoms						Functioning			Hospitalisation		Quality of Life	Hopefulness	
	Overall	Psychosis	Positive symptoms	Negative symptoms	Depression	Anxiety	Global	Social activity	Community belonging	Social disability	Risk of (re)admission	Days in psychiatric hospital	Overall	Personal confidence and hope
Berry & Greenwood (2015)	-	-	-	-	-	-	-	ns (C) + (T)	+ (C) + (T)	-	-	-	+ (C) + (T)	-
Catty et al. (2010)	-	ns (C-KW) ns (C-VW) + (VW)	ns (C-KW) ns (C-VW) + (VW)	ns (C-KW) ns (C-VW) + (VW)	ns (C-KW) ns (C-VW) ns (VW)	ns (C-KW) ns (C-VW) ns (VW)	ns (C-KW) ns (C-VW) + (VW)	-	-	ns (C-KW)	ns (C-KW) ns (C-VW) ns (VW)	-	+ (C-KW) ns (C-VW) ns (VW)	-
Cavelti, Homan, & Vauth (2016)	-	-	-	-	-	-	-	-	-	-	-	-	-	ns (C)
Farrelly et al. (2014)	-	-	-	-	-	-	ns (C) + (T)	-	-	-	+ (C) + (T)	-	-	-
Kayton, Beck, & Soon (1976)	+ (C) ns (T)	-	-	-	-	-	-	-	-	-	-	-	-	-
Novick et al. (2015)	+ (T)	-	-	-	-	-	+ (T)	-	-	-	-	-	-	-
Olfson et al. (1999)	-	-	-	-	-	-	-	-	-	-	ns (T)	-	-	-
Reininghaus et al., (2013)	-	-	-	-	-	-	-	-	-	-	ns (C) + (T)	-	-	-
Tattan & Tarrier (2000)	-	-	+ (T)	+ (T)	-	-	-	-	-	+ (T)	-	-	ns (T)	-

Note. Letter in brackets denotes the informant for therapeutic alliance: (C) = Client, (T) = Therapist/Clinician, (O) = Observer. For Catty et al.'s paper, a further distinction is made: (C-KW) = Client rating of alliance with Clinical Key Worker, (C-VW) = Client rating of alliance with Vocational Key Worker.

Psychiatric Rating Scale (Åsberg et al., 1978), a global psychopathology score that summarised multiple measures (Frank & Gunderson, 1990), the therapist's perception of client change due to the therapy or the Target Complaints Scale (Battle et al., 1996) (Andrews et al., 2016; Frank & Gunderson, 1990; Huddy et al., 2012; Kayton et al., 1976; Lecomte et al., 2012; Lecomte et al., 2015; Mulligan et al., 2014; Novick et al., 2015; Staring et al., 2011). Six papers included a measure of psychotic experiences specifically (Berry et al., 2015; Berry et al., 2016; Catty et al., 2010; Dunn et al., 2006; Goldsmith et al., 2015; Tattan & Tarrier, 2000). They used: the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987), the Psychotic Symptom Rating Scales (PSYRATS; Haddock, McCarron, Tarrier, & Faragher, 1999) the Clinical Global Impression Scale for Bipolar Disorder/Schizophrenia (CGI/CGI-SCH; Spearing, Post, Leverich, Brandt, & Nolen, 1997), the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1989), the Choice of Outcome tool designed for use in CBTp (CHOICE; Greenwood et al., 2009) or a therapist-rated scale of perceived client improvement in symptoms.

Three papers analysed depressive and/or anxiety symptoms at a follow-up time-point (Andrews et al., 2016; Catty et al., 2010; Frank & Gunderson, 1990), drawing on the Beck Depression Inventory (BDI; Beck et al., 1996), the Calgary Depression Scale (Addington, Addington, & Schissel, 1990) or the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983).

Two papers chose to capture the relationship between alliance and degree of client insight, using either a denial of illness score (Frank & Gunderson, 1990) or Birchwood and colleagues' (1994) Insight Scale (Lecomte et al., 2012).

Two papers analysed the link between TA and participant-rated self-esteem. Huddy et al., (2012) applied the Rosenberg Self-Esteem Scale (Rosenberg, 1965)

whereas Lecomte et al. (2012) used the Self-Esteem Rating Scale (Lecomte et al., 2006). It is important to note that the principal investigator of the latter study was also involved in designing this measure of self-esteem.

A further two of the eligible papers investigated TA in relation to client hopefulness. Berry and Greenwood (2015) used the Domain-Specific Hope Scale (DSHS; Sympson, 1999) to assess average hopefulness across academic, work, social, family, romantic and leisure domains. Calveti et al. (2016) applied the Recovery Assessment Scale (RAS; Corrigan et al., 2004) which assessed personal experiences of their recovery process.

Functioning. Ten papers investigated an aspect of functioning at follow-up. The six that assessed global functioning all applied the Global Assessment of Functioning Scale (GAF; American Psychiatric Association, 1994) (Andrews et al., 2016; Berry et al., 2015; Berry et al., 2016; Catty et al., 2010; Farrelly et al., 2014; Novick et al., 2015).

Five papers explored the link between early TA and subsequent social functioning (Berry & Greenwood, 2015; Catty et al., 2010; Davis & Lysaker, 2007; Frank & Gunderson, 1990; Tattan & Tarrier, 2000). These applied the following measures, respectively: mean composite social inclusion scores developed by the first author, the Groningen Social Disability Schedule (GSDS; Wiersma, DeJong, & Ormel, 1988), the social skills domain of the Work Behaviour Inventory (WBI; Bryson, Bell, Lysaker, & Zito, 1997), a study-specific composite score collated from across measures and an adapted version of the World Health Organisation Disability Assessment Schedule (DAS; Jablensky, Schwarz, & Tomov, 1980).

Quality of life. Two papers analysed alliance in relation to quality of life at a T2 (Catty et al., 2010; Tattan & Tarrier, 2000). Both research groups applied the Lancashire Quality of Life Profile (LQoLP; Oliver, Huxley, Priebe, & Kaiser, 1997).

Substance use. Two papers by the same group (Berry et al., 2015; Berry et al., 2016) tracked substance use outcomes. They used the Timeline Follow Back (TLFB; Hjørthøj, Hjørthøj, & Nordentoft, 2012) assessment to identify the extent of participant substance use over the last 90 days. Berry et al. (2015) also collected informant report and hair sample data to verify self-report.

Hospitalisation. Five of the final papers examined (re)hospitalisation as an outcome of their therapeutic intervention (Catty et al., 2010; Farrelly et al., 2014; Frank & Gunderson, 1990; Olfson et al., 1999; Reininghaus et al., 2013). Four of these papers looked at the risk of readmission during the follow-up period while two analysed the amount of time participants spent in a psychiatric hospital.

Therapy engagement. Seven papers, all of which investigated psychological therapy interventions, assessed engagement as an outcome measure. Five examined session attendance (Andrews et al., 2016; Berry et al., 2016; Johnson et al., 2008; Lecomte et al., 2012; Mulligan et al., 2014). Johnson et al. included the additional measure of the Psychological Treatment Compliance Scale; Attendance subscale (PTCS; Tsang, Fung, & Corrigan, 2006). Andrews et al. (2016) distinguished between a low (attended ≤ 8 sessions) and high (9 or more) therapy retention status. Four analyses across three papers grouped participants according to whether they completed therapy or not as a binary outcome. Two papers captured the extent of therapy participation. Johnson et al. did so by using the participation subscale of the PTCS, whereas Lecomte and colleagues used a group participation rating sheet designed by the research team.

3.2. Assessment of methodological quality

The methodological quality of the papers included in this review was evaluated using an adapted version of the NIH tool for the assessment of pre-post studies without a control group (individual ratings detailed in Appendix 3 for psychological intervention papers and Appendix 4 for routine care intervention papers).

It is important to note that just five of the final 23 papers reported original studies (Berry & Greenwood, 2015; Huddy et al., 2012; Kayton et al., 1976; Lecomte et al., 2015; Olfson et al., 1999), while the remaining 18 papers reported secondary analyses from existing trials. The research questions in many of the original trials related to the comparative efficacy of a psychological therapy relative to another modality or TAU. This had two key implications when assessing methodological quality.

First, it was not feasible to rate the studies based on whether their sample size was sufficient to detect a significant effect (i.e. whether they conducted a power calculation prior to recruitment). This is because much of the research included here was not designed specifically to test the TA-outcome association. In practice, it could be that some of the final papers were under-powered to investigate the research questions of interest in the current review. Second, these secondary analysis studies were not marked down if they gave a limited description of the eligibility criteria or intervention(s) for instance, but referred the reader to the parent trial paper for fuller information. Each of these references was checked to ensure that sufficient detail was reported.

3.2.1. Research question and sample

Clarity of research questions. Overall, the papers specified their research questions clearly. Where they were given a '1' rather than the maximum '2' rating, it

was due to a lack of detail. These papers used vague language such as *'patient characteristics'* or *'outcome at follow-up'* rather than laying out their objectives specifically.

Eligibility criteria and sample characteristics. Nearly all the papers outlined their eligibility criteria effectively, including the methods used to determine whether prospective participants were suitable. Just two studies did not warrant the maximum quality rating on this dimension because they neglected to report either part or *any* of their inclusion and exclusion criteria (Kayton et al., 1976; Startup et al., 2006).

Methodological quality in relation to sample characteristics was judged according to participant enrolment; to what extent did the final sample represent the target population in each paper? Nine papers were given the maximum rating because their recruitment process was clearly documented and minimised selection bias (Andrews et al., 2016; Catty et al., 2010; Calveti et al., 2016; Dunn et al., 2006; Farrelly et al., 2014; Mulligan et al., 2014; Novick et al., 2015; Reininghaus et al., 2013; Staring et al., 2011). These described the flow of participants, including the reasons why a subset of eligible service users did not take part. This methodological rigour also involved strategies such as conducting an eligibility screen that covered a complete sampling frame of all service users within participating centres. Given that 17 of the papers did not receive this maximum rating, we must be tentative regarding how far we can generalise the collective findings.

Sample attrition. The reporting of and statistical adjustment for sample attrition was one of the weakest methodological qualities across the final papers. Four were rated at 0 because they conducted a retrospective secondary analysis that included only complete data sets (Calveti et al., 2016; Davis & Lysaker, 2007; Dunn et al., 2006; Reininghaus et al., 2013). This may have introduced bias because

participants who stay in research studies from baseline to follow-up and provide full data may be a niche group within the population, for example, in terms of their compliance or the severity of their condition. Seven of the papers were given the maximum quality rating (Berry et al., 2015; Farrelly et al., 2014; Goldsmith et al., 2015; Johnson et al., 2008; Novick et al., 2015; Olfson et al., 1999; Staring et al., 2011). These reported the proportion of participants who dropped out of the study as 20% or less and/or used a specific analysis strategy to take attrition into account (e.g. intention to treat analysis).

3.2.2. Intervention

Clarity of intervention. Perhaps as might be expected, there was marked disparity between the psychological therapy and routine care papers according to how clearly they described their interventions. Just two of the routine care papers were given the maximum quality rating because they outlined the treatment offered by the EIP service or Care Coordinator (Berry & Greenwood, 2015; Farrelly et al., 2014). By contrast, most of the psychological intervention papers gave an overview of the number of sessions and therapeutic modality offered as well as signposting the reader to the relevant therapy manual. Thus, we can have greater confidence when interpreting the findings from this set of studies because the context of the TA is well-defined.

Intervention fidelity. This domain was only reported in the psychological intervention papers. Most demonstrated that they monitored fidelity and that the intervention was delivered as manualised. Three were marked down to a 1 because they highlighted that intervention fidelity was high or achieved but did not provide the methodology or statistics to support this (Andrews et al., 2016; Dunn et al., 2006; Huddy et al., 2012). Although some of the remaining five papers did describe a

quality control procedure, they gave no information about how far the intervention was delivered as intended (Davis & Lysaker, 2007; Frank & Gunderson, 1990; Lecomte et al., 2015; Mulligan et al., 2014; Staring et al., 2011). Therefore, for this group of papers, we should be cautious before making inferences about the TA-outcome relationship according to specific therapeutic techniques.

3.2.3. Quality of measures

Blinding. Ten papers gained the maximum quality rating on this aspect of methodological quality because they reported that the researcher who assessed treatment outcome was blind to intervention condition/exposure. Two studies were particularly strong in this area. In Johnson et al.'s (2008) procedure, the trial therapists were unaware of the research hypotheses in addition to the assessors being blind to condition. Berry et al. (2015) reported particularly rigorous efforts to set up and maintain assessor blinding. Twelve papers received a 0 rating because they reported no blinding strategy. Blinding was pertinent here because the current review investigates the impact of TA, as a non-specific factor, on outcome. Where blinding was unsuccessful or not in place, there could be a risk that outcome assessment favoured a specific treatment effect over that of a comparison condition that was designed to control for common factors. This risk of bias is especially relevant for papers that were rated at 0 and assessed TA in the context of psychotherapy trials (Dunn et al., 2006; Huddy et al., 2012; Lecomte et al., 2015; Mulligan et al., 2014; Staring et al., 2011).

Measures of therapeutic alliance and outcome. The measures used to assess the quality of the TA were predominantly of high quality. Most papers applied a measure that was psychometrically-supported and, therefore, assessed the TA construct with validity and reliability. With that said, two of the final papers were

given a 0 rating in this area. One of these relied upon the judgment of two clinicians who worked with the participants themselves to determine binary presence-absence of a therapeutic relationship (Kayton et al., 1976). This approach could introduce bias because the raters would naturally feel motivated to present their clinical work in a positive light. The need for agreement between two healthcare professionals offers only a partial guard against this risk to methodological quality. The second paper included an alliance measure that was designed by members of the research team and had not yet been validated within a large sample (Lecomte et al., 2015). Although this could generate methodological concerns, this research group also applied the well-established WAI. It was decided that only the WAI-rated alliance would be applied in the current meta-analysis.

The measures used to assess psychiatric symptoms at follow-up were acceptable overall, with one exception. The 0 rating was given to Mulligan et al.'s (2014) paper because therapists gave idiosyncratic ratings to quantify overall client change due to therapy. This approach could risk inflating the effect of alliance on outcome due to clinician social desirability bias, especially because it was the only outcome measure that tracked change in participants' clinical presentation. The measures used to assess psychotic symptoms were of higher quality than those of general psychiatric symptoms. Only three papers that investigated this cluster of difficulties were rated below the maximum score (Berry et al., 2015; Frank & Gunderson, 1990; Kayton et al., 1976).

Similarly, papers that assessed an aspect of participant functioning at follow-up largely drew on well-established measures. No paper applied an approach that was rated at 0. As an example of one of the three studies that were given a 1 rating, Berry and Greenwood (2015) used a measure of social activity and community

belonging that was psychometrically-supported, but only within a sample of healthy young people at the time of publication. This basis for measure design may lack the specificity needed to detect variation in social functioning within a psychosis-affected sample.

Beyond symptomatology, the remaining outcome measures were relevant to far fewer papers. Wherever quality of life, substance use, self-esteem and hopelessness were assessed, the papers received the maximum quality rating. Across the papers that evaluated therapy engagement, a single study fell below the 2 rating (Lecomte et al., 2012). This measure asked therapists to rate each member's participation in group therapy using what the authors themselves described as a 'home-made' sheet. As already noted, there may have been a degree of bias associated with clinicians rating participation in their own sessions as well as researchers trialling their own unvalidated tool.

Although the combined quality of measures that assessed (re)hospitalisation rates was good, two of the seven relevant papers were rated at 1 (Kayton et al., 1976; Olfson et al., 1999). Both asked participants to report on their own rehospitalisations, one of which did so using a postal questionnaire. This self-report approach could minimise participant difficulties at follow-up due to allegiance to their key clinician and/or the potential stigma associated with a mental health-related admission. Other approaches were of higher quality because they triangulated information from multiple sources.

3.2.4. Statistical methods and reporting. The NIH tool emphasises that high quality statistical analyses in a pre-post intervention study should use *change* in the outcome of interest as their dependent variable. Fourteen of the final papers fulfilled this criterion. This approach is valuable because it allows us to infer the effect of TA,

controlling for baseline scores in the outcome variable. The remaining nine papers either used only the raw outcome scores at T2 or used dependent variables that could not be computed as a change score (e.g. hospitalisation rates).

Two was the modal score for the quality of statistical reporting. Nevertheless, a significant number of papers did not report the statistics necessary to estimate effect size or significance (e.g. not providing the outcome statistic and/or *p* value, especially for non-significant results). This observation is supported by the PRISMA flow diagram (Figure 1) which shows that it was necessary to contact the research group for 13 studies to request additional data. As some authors did not reply to the request, this review could be at risk of the file drawer phenomenon, whereby non-significant findings are underreported.

3.3. Systematic review

Tables 5 and 6 summarise the statistical effect of alliance on the above outcome domains visually (for psychological therapy and routine care interventions, respectively).

The evidence for the association between TA at T1 and symptomatic recovery at a T2 was mixed. Seven out of 15 (47%) relevant analyses reported a relationship with general symptoms and seven of 19 (37%) analyses did so in relation to psychotic symptoms. Goldsmith et al. (2015) uniquely investigated the extent to which alliance interacted with therapy duration to predict psychotic symptomatology. They found that higher attendance predicted an improvement in outcome only where there was a strong TA. Where alliance was poor, a higher dose of therapy had a reverse, detrimental impact. Berry et al. (2016) reported that TA was not a meaningful predictor at their earliest follow-up time point (4.5 months), but it

became significantly related to reduced psychotic symptoms at 9- and 18-month follow-up.

None of the five analyses across three papers that investigated associations with anxiety and depression identified a significant association. TA was a significant variable in one out of three (33%) analyses that examined client insight. Frank and Gunderson (1990) observed this significant and positive relationship between therapist-rated alliance and client insight at 2-year follow-up. By contrast, Lecomte et al. (2012) reported their analyses to be non-significant, whether alliance was rated by client or clinician.

The collective findings for the relationship between alliance and self-esteem at follow-up were comparable, with just one out of four (25%) analyses being significant. Only the client view of the relationship in Lecomte et al.'s (2012) paper was significantly and positively associated with improved self-esteem at follow-up. Similarly, only one out of four (25%) analyses in two of the final papers identified a significant association with quality of life at follow-up. Specifically, Catty et al. (2010) observed a positive relationship between client-rated alliance with their Clinical Key Worker and subsequent enhanced quality of life.

There was greater support for an association between alliance quality and subsequent client hopefulness. Two of three analyses (67%) reported a significant and positive relationship with client and therapist-rated alliance (Berry & Greenwood, 2015).

There was no conclusive association between alliance and global client functioning, with four out of 12 (33%) relevant analyses identifying a significant positive link. The results for social functioning were more promising. Six out of nine analyses (67%) supported a relationship between higher alliance quality during the

intervention and enhanced social functioning at follow-up (or weaker alliance and higher levels of social impairment).

There was minimal support for an association between alliance and substance use outcomes. Just one out of six analyses (17%; across the two papers by the Berry et al. group) found a significant effect. Berry et al. (2015) observed a significant relationship with therapist-rated alliance, such that higher quality alliance was associated with reduced substance use at follow-up. However, it should be noted that this finding reflects therapist-reported perception of change in substance use rather than *actual* outcome.

Ten analyses examined the potential link between alliance and client hospitalisation after the therapeutic intervention. Three out of seven (43%) analyses to investigate hospitalisation as a binary outcome showed a significant relationship, such that good alliance predicted a reduction in the odds of admission. Just one out of three (33%) analyses that looked at number of days spent in a psychiatric hospital identified a significant role for TA.

There was more consistent evidence for a relationship between alliance and client engagement with therapeutic interventions. Six out of ten (60%) analyses found a significant positive association between alliance and session attendance. Therapy completion was significantly associated with alliance during the intervention in three of four (75%) analyses. These significant findings were all related to therapist-rated alliance, while the non-significant finding was linked to an observer's rating. All three analyses that examined the relationship between early alliance and participation in therapy did so within a group therapy context and were significant.

In sum, the current systematic review found particularly promising evidence for a beneficial association between TA at T1 and client social functioning and engagement in psychological therapy at a T2. The links between TA and symptoms, global functioning, client hopefulness and the risk of hospitalisation were not conclusive, although all significant findings indicated a facilitatory relationship. There was no apparent association between TA and the following outcomes: anxiety and/or depression, insight, self-esteem, quality of life or substance use.

3.4. Meta-analyses

3.4.1. Papers included in the meta-analyses. Nine papers were synthesised in the meta-analyses because they each investigated the strength of the association between early TA and change in mental health symptoms between baseline and follow-up using a correlational approach (Andrews et al., 2016; Berry et al., 2015; Dunn et al., 2006; Frank & Gunderson, 1990; Huddy et al., 2012; Lecomte et al., 2012; Lecomte et al., 2015; Mulligan et al., 2014; Staring et al., 2011). As noted when evaluating the quality of statistical reporting, these research groups provided sufficient data in their original publication or on request to be included in the quantitative stage of the review.

All but one (Staring et al., 2011) analysed this association of interest in the context of a manualised psychological therapy. Number of sessions ranged from 10-40 and the therapies spanned from 3 months-2 years. This variation can be understood according to the therapeutic modalities represented among the papers. Six of them delivered CBTp (independently or combined with MI techniques) in a one-to-one, group or telephone-delivered format. The remaining interventions were: treatment adherence therapy, cognitive remediation therapy and individual

psychotherapy. The timing of follow-up ranged from after therapy Session 9 (mid-intervention)-2 years post-baseline (end of intervention/post-intervention follow-up, depending on duration of each client's therapy).

3.4.2. Association between therapeutic alliance and outcome. In some papers, where stronger alliance was associated with improved symptom outcome the correlation coefficient was a negative value (i.e. symptom reduction). For clarity of interpretation, these coefficients were entered as positive values, such that a positive correlation indicated a beneficial association. The reported effect size for all nine papers was Pearson's r . I^2 was applied as a measure of between-study consistency and interpreted using Higgins and colleagues' guidance thresholds (Higgins, Thompson, Deeks, & Altman, 2003). Although tests for funnel plot asymmetry can be used to assess a range of factors, including the potential impact of reporting biases and poor methodological quality, they were not examined here. This is because a small number of studies was included in each of the meta-analyses and, in such cases, test power can be too low to distinguish between chance and genuine asymmetry (Sterne et al., 2011).

Therapeutic alliance and change in overall symptoms. Five papers examined the association between client-rated alliance and change in a global measure of symptomatology. Figure 2 represents the results in a forest plot (presented with Figure 3 for visual comparison with therapist-rated alliance). The meta-analysis showed that the aggregate random effects estimate for client-rated alliance and overall symptoms at follow-up was $r = 0.29$ ($k = 5$; 95% CI = 0.13-0.45; $Z = 3.50$; $p = .0005$). This highly significant association suggests that clients who reported a stronger alliance at T1 during a psychological intervention showed greater improvement in global symptoms at T2. Heterogeneity testing generated a non-

significant Q value of 2.83 ($p = 0.59$), indicating that the difference between effect sizes was not significantly greater than would be expected based on sampling error. As I^2 was 0%, we can infer that the observed variance was not due to between-study variance.

Figure 2. Forest plot for correlational meta-analysis of associations between client-rated therapeutic alliance and change in global symptomatology

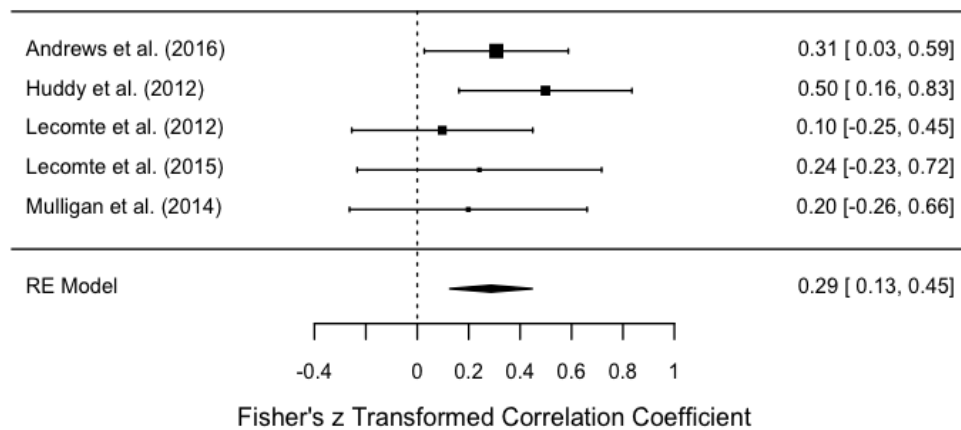
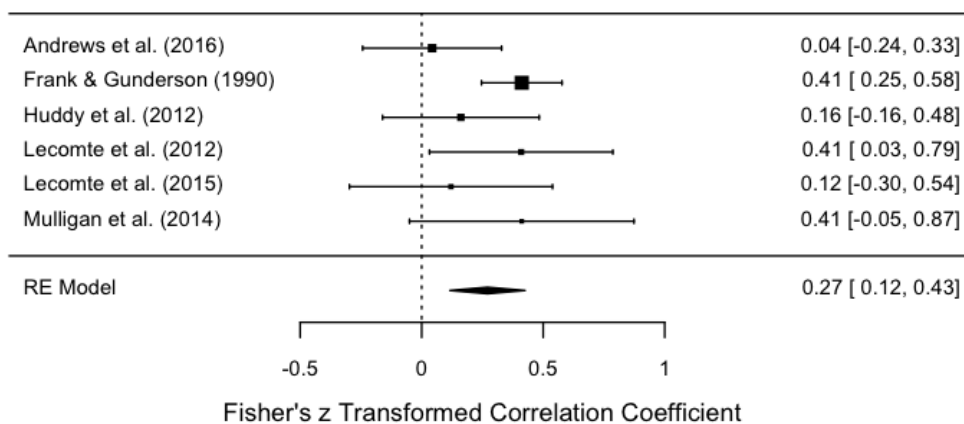


Figure 3. Forest plot for the correlational meta-analysis of associations between therapist-rated therapeutic alliance and change in global symptomatology



Six papers examined therapist-rated alliance in relation to change in global symptoms. As highlighted by Figure 3, the aggregate random effects estimate was $r = 0.27$ ($k = 6$; 95% CI = 0.12-0.43; $Z = 3.43$; $p = .0006$). This significant association suggests that high quality therapist-rated alliance was associated with significantly greater improvement in client symptoms at follow-up. Heterogeneity testing generated a non-significant Q value of 6.82 ($p = 0.23$), indicating that the difference between effect sizes was not significantly greater than would be expected due to sampling error. I^2 was 33.14%, indicating a low-to-moderate level of variance.

Therapeutic alliance and change in psychotic symptoms. Four papers examined the association between client-rated alliance and change in psychotic symptoms. Indeed, each of these examined the positive symptoms of psychosis specifically. The five relevant analyses reported across these four papers are summarised in Table 7.

Table 7. *Correlational analyses of the association between client-rated therapeutic alliance and change in positive psychotic symptoms*

Study	N	<i>r</i>	<i>p</i>
Berry et al. (2015)	89	0.15	0.17
Dunn et al. (2006)	29	0.11	0.57
Lecomte et al. (2015)			
<i>PSYRATS: Hallucinations</i>	8	0.03	0.94
<i>PSYRATS: Delusions</i>	11	0.10	0.77
Staring et al. (2011)	100	0.22	0.03

Note. Italicised grey font indicates an effect size that was not included in the final meta-analysis but is reported here for clarity.

While four of the papers analysed positive symptoms overall using the relevant sub-scale of the PANSS, Lecomte et al. (2015) reported their findings from the

PSYRATS separately for delusions and hallucinations. The effect on delusions was marginally higher but sample sizes were small and neither coefficient was significant. Rather than over-representing this paper by including both effect sizes, careful consideration was given to the most appropriate synthesis strategy. Existing meta-analytic evidence shows a superior effect of CBTp on hallucinations, whereas its effect for delusions reduces to non-significance when compared against active treatment control groups (Mehl, Werner, Lincoln, 2015; van der Gaag, Valmaggia & Smit, 2014). Hence, selecting one of the PSYRATS outcomes arbitrarily could have posed a risk of bias either for or against finding a significant TA-outcome effect.

The meta-analysis was trialled three ways: (1) with the delusions measure only, (2) hallucinations measures only and (3) without the Lecomte et al. (2015) paper. The results were highly similar (see Appendix 5 for full reporting). A non-significant Q value (0.41, $p = 0.94$) indicated that the difference between effect sizes was not significantly greater than would be expected based on sampling error. As I^2 was also 0% for each, we can infer that the observed variance was not due to between-study heterogeneity. On these grounds, the paper was included in the final correlational meta-analysis using the PSYRATS delusions measure only because it represented the largest sample size ($r = 0.17$ ($k = 4$; 95% CI = 0.04-0.31; $Z = 2.56$; $p = .0105$)). As shown in Figure 4 (presented with Figure 5 for visual comparison with therapist-rated alliance), the significant association from this meta-analysis suggests that high quality client-rated alliance was associated with significantly greater improvement in positive symptoms at follow-up.

Three of the final papers tested the association between therapist rated-TA and change in positive psychotic symptoms. The same strategy was applied for Lecomte et al.'s (2015) disaggregated PSYRATS data as before, such that only

change in client delusions was included in the meta-analysis (see Table 8 and Figure 5). As well as allowing consistency across the current meta-analyses, this strategy was justified because the results were again highly similar when trialled with the hallucinations measure only (Appendix 5). High quality therapist-rated alliance was associated with significantly greater improvement in psychotic symptoms at follow-up ($r = 0.30$ ($k = 3$; 95% CI = 0.17-0.43; $Z = 4.62$; $p < .0001$)). The Q value was non-significant (0.28, $p = .87$), indicating that heterogeneity between effect sizes was not significantly greater than would be expected as a result of sampling error. I^2 was 0% which suggests that the observed variance was not due to variance between studies.

Table 8. *Correlational analyses of the association between therapist-rated therapeutic alliance and change in positive psychotic symptoms*

Study	N	<i>r</i>	<i>p</i>
Berry et al. (2015)	89	0.31	0.001
Frank & Gunderson (1990)	143	0.29	0.05
Lecomte et al. (2015)			
<i>PSYRATS: Hallucinations</i>	11	0.47	0.15
<i>PSYRATS: Delusions</i>	15	0.16	0.58

Note. Italicised grey font indicates an effect size that was not included in the final meta-analysis but is reported here for clarity.

4. Discussion

4.1. Overview of findings

The current meta-analysis and systematic review set out to investigate the extent of the association between early TA during interventions for psychosis and treatment outcome at a follow-up time-point. Historically, psychotherapy has been the typical setting for alliance-outcome research. Over recent years, there has been increasing interest in the applicability of the TA construct to community psychiatry.

Figure 4. *Forest plot for the correlational meta-analysis of associations between client-rated therapeutic alliance and change in positive psychotic symptoms*

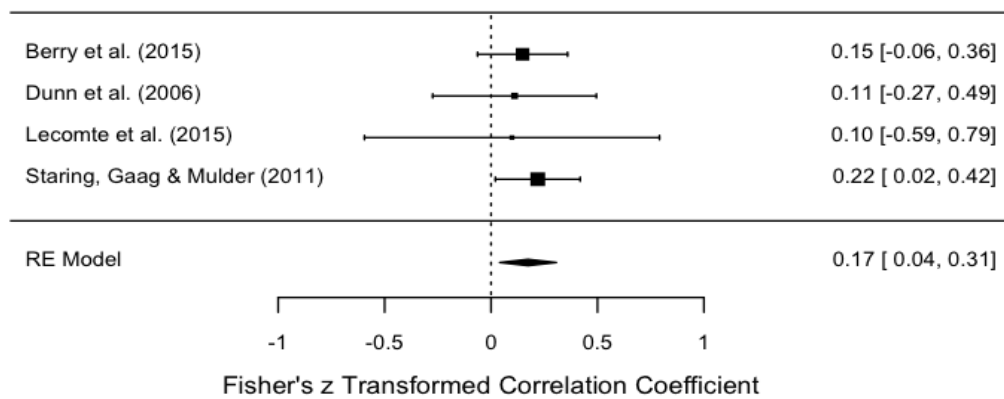
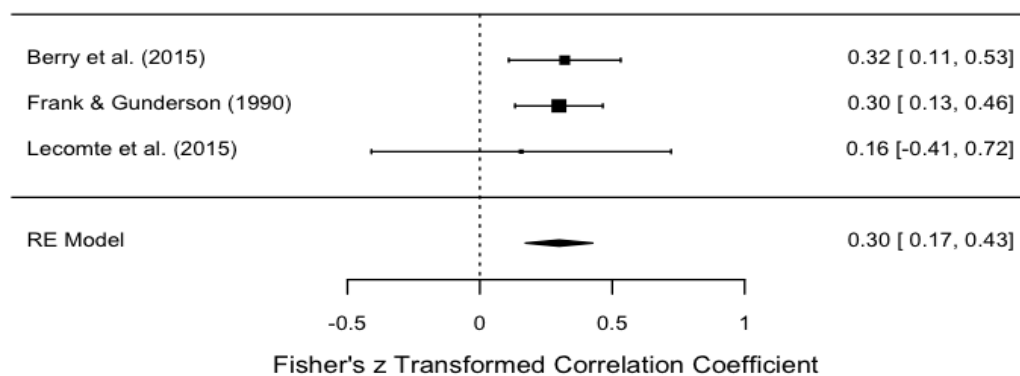


Figure 5. *Forest plot for the correlational meta-analysis of associations between therapist-rated therapeutic alliance and change in positive psychotic symptoms*



This review makes an important contribution to the field given that it is the first to examine alliance between clients experiencing psychosis and *any* healthcare professional. Intervention was broadly defined and inclusive of psychotherapy and routine care contexts.

4.1.1. Current meta-analysis and systematic review. The present meta-analyses reported a significant association between therapist- as well as client-rated TA and change in global symptoms as well as positive symptoms of psychosis.

Whilst the effect size for change in global symptomatology was moderate and consistent across therapist ($r = 0.27$) and client ($r = 0.29$), there was a greater degree of variation for change in psychotic symptoms ($r = 0.30$ and $r = 0.17$, respectively).

Indeed, the current systematic review indicated these significant associations for symptomatology as worthy of further investigation. A promising link between alliance and clients' subsequent engagement in psychological therapy, hopefulness, social functioning was also identified. By contrast, we cannot have confidence that there is any significant relationship between TA at T1 and clients': global functioning, symptoms of anxiety and depression, insight, self-esteem, quality of life, substance use or hospitalisation rates at a T2.

4.1.2. Current findings in the context of existing meta-analyses. Three existing meta-analyses have identified a significant TA-outcome association in the context of psychotherapy, across diagnostic groups. Horvath and Symonds (1991) pooled treatment outcome across diverse variables and reported an $r = .26$ effect size. An update of their review found a consistent, if slightly smaller effect ($r = .22$; Martin & Garske, 2000). With the same research focus, Flückiger et al. (2012) found a larger aggregate effect size ($r = .29$). The results of the current meta-analyses are broadly consistent with these previous reviews, with effect sizes ranging from $r = .17$ -.30. Horvath and Symonds' paper was unique among the previous meta-analyses because it found that client and observer ratings of the alliance offered a better prediction of outcome than therapist reports. Here, the effect size for client-rated alliance and change in global symptomatology was slightly larger than for therapist ratings. However, as outlined above, this was not replicated when the dependent variable was limited to positive psychotic symptoms only.

4.2. Interpretation of findings

4.2.1. Significant association between therapeutic alliance and change in global symptoms: The role of intervention format? There was a significant positive association between TA and subsequent change in global psychiatric symptomatology. The focal psychological intervention is a key point of difference between the individual papers that found (Andrews et al. 2016; Huddy et al., 2012) and did not find a significant association. All five papers examined alliance in the context of a manualised intervention, but only Andrews et al. and Huddy et al. applied a one-to-one, face-to-face psychological therapy (a CBT-informed healthy lifestyles intervention and cognitive remediation therapy, respectively).

By contrast, the other papers included either a group (group CBTp or group skills training, Lecomte et al., 2012; group CBTp, Lecomte et al., 2015) or telephone-delivered intervention (Mulligan et al., 2014). Specific challenges associated with group therapy in the context of psychosis offer one way to understand this pattern. Challenges include differing levels of client motivation, the need to balance contributions of multiple members and psychotic experiences themselves as barriers to engaging with group discussion (e.g. hearing voices) (Spidel, Lecomte, & Leclerc, 2006) and are not present to the same degree in one-to-one therapy.

This distinction applied for client-rated TA but not for *therapist*-rated alliance and change in overall psychiatric symptoms. Here, the two significant findings represented individual psychotherapy (Frank & Gunderson, 1990) and telephone-delivered CBTp (Mulligan et al., 2014). Thus, it appears important for clients to perceive a strong TA if they are to achieve improvement in their global symptomatology. This link may be particularly influential in individual, in-person

interventions given the well-documented challenges associated with engaging clients with psychosis in therapy (e.g. Kuipers et al., 1997).

4.2.2. Significant association between therapeutic alliance and change in psychotic symptoms: Length of therapy and timing of follow-up assessment.

The current meta-analyses for change in psychotic symptoms indicate the potential impact of time on the strength of the association. Across the two meta-analyses investigating client- and therapist-rated TA, three papers reported a significant effect (Berry et al., 2015; Frank & Gunderson, 1990; Staring et al., 2011). These trialled substantially longer interventions (6 months-2 years) and follow-up periods (1-2 years post-baseline) relative to those that did not (Dunn et al., 2006; Huddy et al., 2012; Lecomte et al., 2015: Intervention length = 3 months-17.8 sessions [Mean], Follow-up period = mid-intervention [Session 9]-3 months).

Goldsmith et al. (2015) observed that alliance quality has a moderation effect on whether attending more sessions is beneficial or detrimental for psychotic symptoms at follow-up. Together with the current findings, this observation may highlight that intervention length as well as length of follow-up are important considerations when investigating the relationship between alliance and change in psychotic symptoms. This could have relevance for treatment delivery because the current NICE (2014) guidance advises that CBTp should be offered '*over at least 16 planned sessions*'. If the above pattern was supported by rigorous research designed specifically to investigate the impact of therapy duration, it could be advisable to increase this lower limit for number of sessions to allow more time for engagement at the outset of the intervention. Nonetheless, it is important to be conservative when interpreting these findings. As these papers assess a range of interventions,

therapeutic modality may have acted as a confound for the apparent influence of therapy duration.

Considerations related to the measurement of TA as well as psychotic symptoms are a further basis for careful interpretation. In the current review, one of the three papers that reported a significant effect was rated down for the quality of its psychotic symptomatology measure. Berry et al. (2015) asked therapists to rate their impression of change in client symptoms. In general, there is a risk of social desirability bias when asking the therapist to rate TA because they may be motivated to report improvement and demonstrate their clinical skill. The risk of bias may have been compounded in this paper because they applied an unvalidated measure of change in psychotic symptoms.

Staring et al. (2011) were unique in reporting a significant association between *client*-rated TA and change in psychotic symptoms. In contrast to other papers in this review that investigated TA during psychological interventions, each client's community clinician from routine care rated alliance and not the new clinician who delivered therapy. Thus, the beneficial impact of psychological therapy on clients' psychotic symptoms may have been facilitated by an ongoing, familiar alliance in their community team. Although this mechanism would be a valuable focus for future research, we can only venture this interpretation tentatively in the present review.

In sum, intervention duration could be important for understanding the observed association between alliance and change in psychotic symptoms. However, there is a risk that this effect is, at least in part, an artefact of: the underlying impact of therapeutic modality, potential bias in assessment of psychotic symptoms and/or

the interplay between simultaneous bonds with psychotherapy and routine care clinicians.

4.2.3. Correlation vs. causation considerations. Despite the consistent small-to-moderate association between TA and change in symptoms identified in the current and existing meta-analyses, three conceptual issues remain.

The first is the need for conservative claims about any TA-to-outcome *relationship*, from the current *correlational* meta-analysis. Researchers cannot manipulate TA experimentally, as for example, with the dose of a medication (Del Re, Flückiger, Horvath, Symonds, & Wampold, 2012). We can infer the presence of a significant correlation with confidence, but it is far more challenging to establish a causal relationship. By specifying in the inclusion criteria that eligible papers must assess TA at one time-point and outcome at a subsequent time-point, this review aimed to act on the precedence criterion for inferring causality (Barker & Pistrang, 2015). Furthermore, as papers included in the meta-analyses assessed early TA in relation to *change* in symptoms over time, we are more able to venture that TA quality facilitates improvement, rather than being only a by-product of it (Constantino et al., 2007).

However, the strongest causal accounts are also able to exclude alternative explanations for observed covariance between measures (Barker & Pistrang, 2015). For instance, greater attachment security is associated with stronger TA in adult psychotherapy clients (Diener & Monroe, 2011) and greater attachment insecurity in service users with psychosis has been linked to lower quality TA (Kvrgic et al., 2011). Zilcha-Mano (2017) posits an interaction effect whereby clients with a 'trait-like' capacity for forging strong interpersonal bonds are more able to benefit from the 'state-like' quality of their alliance with a specific therapist during a given

intervention. Hence, attachment (in)security would have a plausible role in the TA-outcome relationship, but investigating this was outside the scope the current review.

Second, even if established, a significant predictive relationship does not indicate whether TA has a direct or facilitatory impact on intervention efficacy. A direct role for TA is credible because, if a strong relationship is not established there is a risk that clients will disengage from an intervention altogether, thus blocking a beneficial treatment effect (Dunn et al., 2012). Further, when service users are consulted, consistency, empathy, trust and collaboration with their therapist come to the fore as essential intervention components (Lawlor et al., 2017; Wood et al., 2015).

This perspective is striking given that participants in the Lawlor et al. and Wood et al. studies were undergoing CBTp. CBTp conceptualises TA as foundational to treatment efficacy but secondary to the contribution of specific intervention strategies. MI presents an alternative account; the therapist's stance towards the client *is* the mechanism of behavioural change (Miller & Rollnick, 2012; Moyers et al., 2005). While this review restates the beneficial link between TA and improvement in symptoms, this different theorised role for TA between modalities highlights the need for further research to clarify the alliance-outcome pathway.

The third of these considerations is that focusing on the alliance-to-outcome effect may only represent one part of a *bidirectional* relationship. Just as strong alliance could predict symptom improvement, so clients are likely to be better able to establish an alliance *once* they have seen a reduction in their symptoms. Although alliance is often established early in the work, it continues to evolve throughout an intervention according to the challenges that client and clinician face and resolve

together (Elvins & Green, 2008; Horvath, Gaston, & Luborksy, 1993). TA is likely to influence as well as be influenced by 'outcome'.

The current review demonstrates an overarching alliance-outcome association for clients with psychosis, but cannot elucidate a mechanism of effect. Further research is warranted to address this gap in the literature, especially in the context of interventions for those with a serious mental illness (Hasson-Ohayon, et al., 2017).

4.3. Strengths and limitations

The current review is the first to synthesise the evidence for the association between TA and a range of outcomes from interventions for service users with psychosis. By encompassing interventions across both psychotherapy and psychiatric care contexts, it reflects contemporary interest in the role of TA beyond individual psychotherapy (Howgego et al., 2003; Priebe et al., 2011). A notable strength was its comprehensive method of sourcing data to enhance the scope of the qualitative and quantitative synthesis. A proactive approach to contacting research groups was taken where eligible papers did not report the relevant data in full. Such a strategy was successful in gathering effect sizes from more of the eligible studies, thus ensuring that meta-analysis was feasible. This review also tailored an existing NIH tool to assess methodological quality rigorously. It was used to consider how studies that examine the role of TA must be contextualised within the ongoing debate surrounding the role of non-specific factors in intervention efficacy.

4.3.1. Barriers to quantitative synthesis: Heterogeneity of analyses and reporting. Only a sub-set of the final papers could be included in the present correlational meta-analyses because the remaining studies either reported alternative statistical methods or conducted the relevant correlational analyses but selectively

reported only significant results. Although research groups were emailed to request the necessary statistics, non-response or inability to provide the relevant data automatically narrowed the scope of the review.

4.3.2. Barriers to quantitative synthesis: Heterogeneity of outcome measurement. A further barrier to conducting the current meta-analysis was the considerable methodological diversity across the final papers. The eligibility criteria were designed to allow for a broad definition of treatment outcome, rather than an exclusive impairment-focus. However, the final meta-analyses collate only symptom-focused data because no other outcome measure was used with sufficient between-study consistency. For this reason, the current review may present a reductionist view of outcome in view of the multi-faceted definitions of recovery in psychosis (Bertolote & McGorry, 2005) and particularly those identified by service users themselves (Pitt, Kilbride, Nothard, Welford, & Morrison, 2007).

The limits of the quantitative synthesis are also notable given that the present review hoped to show sensitivity to emerging interest in alliance-outcome research within a community psychiatry setting. Studies in this area are far less common than those with an exclusive psychotherapy focus. Although nine routine care papers were included, the outcome measures they assessed and the statistical methods applied lacked consistency between themselves or with the psychological intervention papers. Unfortunately, this meant that they could be incorporated in the present systematic review, but not the quantitative synthesis.

This limitation is consistent with the challenges identified by existing reviews of TA in a community mental health context. One descriptive (Howgego et al., 2003) and another systematic vote-count (Priebe et. al., 2011) review have highlighted a trend towards strong TA with a community clinician being associated with improved

treatment outcome. However, Priebe and colleagues have observed that methodological heterogeneity in the field renders quantitative synthesis unfeasible. The current systematic review collated findings across psychotherapy and routine care related to any outcome variable that was assessed by two papers or more with the intention of representing the contemporary state of the evidence, even where meta-analysis could not be justified.

4.4. Implications for future research

4.4.1. Designing original studies for alliance-outcome research. As outlined above, the current review identified diversity in the way that the eligible papers conducted and reported their statistical analyses. It is likely that one basis for this variation is a fundamental difference in their original research questions. Just five of the 23 papers reported studies that were designed originally to assess the alliance-outcome relationship. The remaining papers investigated this research question through secondary data analysis from existing trials that evaluated the efficacy (or comparative efficacy) of a specific intervention. This current state of the evidence presents two challenges.

A significant moderator effect of researcher allegiance has been identified in alliance-outcome research, such that the association is higher where study authors have designed the measure they use to operationalise alliance (Flückiger et al., 2012). Perhaps there is an analogous risk of bias when investigating the role of alliance in the context of treatment efficacy trials. Researchers in some of the final papers may have been motivated to find support for the focal intervention's specific effect, over and above the impact of alliance as a non-specific factor (Luborksy, 1995; Marcus et al., 2014; Turner et al., 2014).

Furthermore, research using secondary data may be under-powered to explore the role of alliance if original power calculations did not take these subsequent analyses into account. In line with Priebe and McCabe's (2006) conclusions, the current review underscores the need for more original studies in this field, with a central place for the alliance-outcome relationship in the research questions and analyses. This stance is in keeping with calls for greater emphasis on rigorous investigation of non-specific factors when designing RCTs of psychological therapy for psychosis (Bendall et al., 2006).

Such original research would have the additional value of facilitating a shift towards greater methodological consistency within the field. The current systematic review highlighted promising links between positive TA and other treatment outcomes, aside from symptom reduction (e.g. enhanced social functioning). However, these could not be explored using a meta-analytic approach.

A relationship between developing a strong bond with a clinician and an increasing ability to engage socially with others would be highly plausible. Across interventions for psychosis, a strong TA is characterised by empathy, acceptance and collaboration, and to a greater degree than some clients may have experienced in previous relationships (Evans-Jones, Peters, & Barker, 2009). Furthermore, Berry and Greenwood (2015) have established that positive social relationships promote hopefulness among service users with psychosis. They suggest that interactions with healthcare professionals are no exception to this link between relationship quality and development of hope for recovery. With sufficient studies in this area, a meta-analysis would be able to draw together evidence for TA in relation to change in social functioning; an integral facet of recovery in psychosis (Bertolote & McGorry, 2005).

4.4.2. Debate about heterogeneity in the alliance construct:

Psychotherapy vs. community psychiatry. However, it could be argued that the current review's call for greater methodological consistency across psychotherapy and routine care settings risks reductionism. Emphasising synthesis may obscure genuine between-setting differences in the nature of the client-clinician relationship: *'when we measure the alliance in psychiatric settings, are we talking about the same thing?'* (Catty 2004, p. 264). Key differences for the TA when studied in psychiatric care can include: clinician-initiated work, the potential for involuntary treatment, the lack of a contract for a fixed number of regular sessions and client contact with multiple professionals who offer a range of interventions rather than a single model of therapy (Catty, 2004; Priebe & McCabe, 2006). Despite these differences, relationships in routine care are pivotal because they provide the context for discussions related to diagnosis and care planning in addition to therapeutic interventions.

The papers included in the current review represent two measures of alliance that were designed specifically to assess alliance within community psychiatry, rather than adapted from psychotherapy research (STAR, McGuire-Snieckus, McCabe, Catty, & Priebe, 2007; HAS, Priebe & Gruyters, 1993). It will be crucial to conduct further studies with this emerging focus on multi-disciplinary community care if we are to build better understanding of the alliance-outcome relationship beyond psychotherapy.

4.5. Implications for clinical practice

4.5.1. Challenges to the therapeutic alliance in psychosis. The evidence base reviewed here established that clients with psychosis can develop a strong TA.

Moreover, there is a significant association between the quality of this relationship and change in symptoms over time. This could suggest that TA is important in enabling intervention efficacy, which may be an especially critical consideration when working with service users affected by psychosis. This client group may be highly emotionally avoidant or mistrustful of the therapist at the outset of therapy (Rollinson et al., 2008). In addition, the prevalence of an insecure attachment style is significantly higher among those with psychosis relative to a non-clinical population (76% vs. 36%; Carr et al., 2017). Carr et al.'s meta-analysis identified fearful attachment as the most common form of insecurity within the psychosis group. This could have relevance for the process of building the TA. Fearful attachment in adulthood could involve the client experiencing a simultaneous pull towards and push away from establishing emotional closeness with their therapist (Bartholomew & Horowitz, 1991).

Indeed, attachment insecurity has been linked to paranoia in the context of psychosis; another factor that could impact upon the therapeutic relationship and, thus, treatment outcome. Insecure attachment predicts paranoia, as mediated at least in part by negative self-esteem (Wickham, Sitko, & Bentall, 2015). Further, clients report paranoid thoughts about their therapist when invited to share their experience of CBTp (Lawlor, Hall, & Ellett, 2015). Lawlor et al.'s qualitative research found that the struggle to trust therapists' intentions was present both within and between sessions. Indeed, this difficulty may extend beyond the early-stage sessions when the therapist is a relative stranger. In an experience sampling study (Collip, Oorschot, Thewissen, van Os, Bentall, & Myin-Germeys, 2011), participants with high paranoia described a perception of social threat *regardless* of how well they knew the people they were interacting with at a given moment.

4.5.2. How can clinicians respond to these challenges? Although the alliance can be threatened by the challenges explored above, it can still be formed where clinicians are sensitive to the needs of the client group (Hasson-Ohayon, et al., 2017). Collip et al.'s (2011) findings suggest that clinicians must consider how they interact with these clients carefully throughout the course of their work if they are to establish a therapeutic relationship.

Fornells-Ambrojo and colleagues (2016) have hypothesised that those who report high paranoia may require greater interpersonal responsiveness from those they interact with before they can develop trust. Chadwick (2006) advocates for therapists taking a client-tailored approach when working with psychosis, rather than focusing on how therapy 'should look'. He argues that therapists must move away from the task of getting this client group to stay in therapy, towards building a '*radically collaborative*' relationship. This perspective is perhaps consistent with the findings of the current review: there is a significant benefit for client symptomatology when clinicians manage to build a strong TA despite the barriers presented by psychosis.

Routine assessment of the TA during interventions for psychosis may be beneficial to detect threats to the relationship as they arise (Wood et al., 2015). Another perspective for clinicians to hold in mind is that therapy for clients with psychosis may require considerable engagement groundwork. This recognition could prompt therapists to delay the introduction of highly-structured sessions or specific intervention techniques until they feel confident that the TA has developed to a sufficient level (Rollinson et al., 2008).

5. Conclusions

The current paper builds upon existing reviews by drawing together the evidence for the relationship between early alliance and subsequent outcome from therapeutic interventions for clients with psychosis. This focus is pertinent because there are known barriers to building an alliance in the context of psychosis and, historically, clients living with a serious mental illness have been overlooked by this field of research. A further contribution of the review is its inclusion of psychotherapy as well as community psychiatry interventions. It was observed that strength of alliance during interventions (T1) was significantly and positively associated with change in global as well as the positive symptoms of psychosis at a T2. This finding remained, independent of whether alliance was rated by therapist or client.

It is acknowledged that the current correlational meta-analyses reflect only one perspective of recovery in psychosis (i.e. improvement in symptomatology) and, furthermore, cannot elucidate the mechanism(s) of effect. Heterogeneity within the evidence base is recognised as an additional limitation. The papers varied considerably in the measures used to operationalise outcome in particular. A further crucial observation is that only a minority of studies to-date have been designed to assess the role of alliance in shaping outcome for service users with psychosis as a primary research question. This review calls for more original studies in the field to ensure that analyses are adequately powered, findings are reported in full and outcome measures beyond symptomatology are investigated. It is also recommended that the nature and impact of alliance should be explored further outside of consistent, structured, one-to-one psychotherapy sessions.

Fundamental, applied implications of this review are that service users can experience a strong bond with their clinician during interventions for psychosis and, moreover, when this high-quality TA develops it is associated with greater improvement in symptoms over time. Exploring the intervention factors and individual differences that may influence this process was beyond the scope of this paper. However, together with existing research, the current findings would guide clinicians working with this client group to: systematically monitor the quality of the TA, emphasise engagement from the outset and adopt a stance characterised by interpersonal responsiveness, empathy, genuineness and collaboration.

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Part 2: Empirical Paper

**Attachment Security, Trust and Imagined Attachment Behaviours: An
Exploratory Study within a General Population Sample**

Abstract

Aims: Guided imagery can be used to assess adult attachment. To-date, no such measure has been developed to explore *imagined* attachment behaviours. This study investigated whether attachment style and experiences during a virtual interaction would be associated with responses on a new prospective imagery attachment task (the PIAT).

Method: A general population sample ($N = 70$) experienced a brief interaction with an avatar within a virtual flat environment. Level of attachment security was assessed pre-VR using the Relationship Questionnaire (RQ; Bartholomew & Horowitz, 1991). Trust towards the avatar was assessed through interpersonal distance during the interaction, as well as retrospective self-report trustworthiness ratings. The PIAT assessed the perceived likelihood of seeking physical proximity, making an emotional disclosure, experiencing comfort following this disclosure and receiving a sensitive response in a hypothetical scenario characterised by mild distress. PIAT vividness ratings were used to explore the feasibility of prospective attachment-focused mental imagery.

Results: Average vividness on the task was moderate and comparable to existing imagery research using a similar methodology. The PIAT showed acceptable internal reliability. RQ attachment security was significantly associated with the PIAT physical proximity, emotional disclosure and comfort items. There was a significant positive correlation between subjective trust and perceived likelihood of emotional disclosure. Interpersonal distance during VR was associated with greater perceived likelihood of feeling comforted after such imagined emotional disclosure.

Conclusions: The PIAT showed good feasibility and acceptability as well as promising concurrent validity. Key task items were positively associated with subjective and objective trust. Findings are explored in relation to adult attachment theory, peer attachment and the impact of attachment security when meeting new people. Despite methodological limitations, the findings have important implications for mental imagery researchers, as well as potentially for clinicians at the early stage of building a therapeutic alliance.

1. Introduction

1.1. Attachment across the lifespan

Attachment is a specific type of emotional bond that a person forms with a stronger and wiser figure who can offer protection and/or comfort in times of distress (Mikulincer & Shaver, 2016). From an ethological-evolutionary perspective, attachment facilitates survival during a time when infants are at their most defenceless (Bowlby, 1958). The Strange Situation Task (Ainsworth and Bell, 1970), a separation-and-reunion procedure, provided a gold standard operationalisation of infant attachment. Securely attached infants were observed to use their parent as a safe base to explore an unfamiliar environment and showed distress in addition to reduced exploration when separated from them. Crucially, these infants sought physical proximity to and were easily soothed by their attachment figure upon reunion, facilitating a return to exploration and play. Thus, attachment security offers the infant a sense of trust in those around them and a process for successful emotional regulation (Kobak & Sceery, 1988; Mikulincer & Shaver, 2008).

Beyond infancy, attachment is an organising force for behaviour that is active across the lifespan (Grossman, Grossman, & Waters, 2006; Sroufe, 2005; Sroufe & Waters, 1977). This longitudinal perspective highlights the relationship between early attachment security and developmental outcomes later in life. Attachment insecurity is associated with an increased risk of internalising (Groh et al., 2012) as well as externalising behaviours (Fearon, Bakermans-Kranenburg, van Ijzendoorn, Lapsley, & Roisman, 2010) during childhood and subsequent adult psychopathology (Dozier & Stovall-McClough, & Albus, 2008). By contrast, early attachment security is predictive of developmental advantages including enhanced language development (van Ijzendoorn, Dijkstra, & Bus, 1995) and peer competence (Groh et al. 2014).

Early bonds with caregivers construct internal working models that act as templates for subsequent close relationships (Bowlby, 1973). In their Relationship Questionnaire, Bartholomew and Horowitz (1991) characterise adult attachment security as a comfort with emotional closeness and interdependence, as rooted in positive concepts of self and others. Therefore, from adolescence onwards, the individual can seek proximity and comfort in times of distress from within a personal hierarchy of diverse attachment figures (e.g. friends, siblings, romantic partners, colleagues or a therapist) (Mikulincer & Shaver, 2016).

Internal working models have been conceptualised as a dynamic attachment *orientation*, rather than one fixed attachment style (Carnelley, Otway, & Rowe, 2015; Baldwin et al., 1993). Mikulincer and Shaver (2016) draw on the work of Bowlby (1982) to argue for an attachment behavioural system (ABS). When an individual perceives threat, a system of attachment behaviours is activated while others (e.g. care-giving, exploration or sexual systems) are down-regulated. In this way, an attachment bond endures over time and space but is most evident when an internal or external stressor triggers attachment behaviours. These strategies are designed to bring the individual and an attachment figure together, increasing opportunities for comfort and support (Ainsworth & Bell, 1970).

1.2. Attachment priming research

1.2.1. The effects of attachment priming. Sub- and supraliminal stimuli⁴, including words, images and interpersonal memories, can be applied to prime attachment security (Gillath & Karantzas, 2018). A priming effect is supported by

⁴ Subliminal primes are attachment-related stimuli *outside* of direct participant awareness (e.g. images designed to evoke attachment security). Supraliminal primes are *within* awareness (e.g. asking participants to recall a memory of a significant other being loving and supportive).

evidence that participants exposed to visual secure attachment stimuli show a reduced amygdala response when exposed to threatening faces and words subsequently (Norman, Lawrence, Iles, Benattayallah, & Karl, 2015). Even the *imagined* presence of a secure attachment figure can facilitate such down-regulation of distress (e.g. reduction of public speaking-related cardiovascular reactivity; Grewen, Anderson, Girdler, & Light, 2003). Imagining an attachment figure can successfully reduce both negative thoughts and negative affect following recall of an upsetting autobiographical memory (Selcuk, Zayas, Günaydin, Hazan, & Kross, 2012). Reminders of a secure attachment bond can enhance mood, over and above stimuli that are emotionally-positive but not attachment-related (Mikulincer & Shaver, 2016). Thus, secure priming can bring the emotional regulation benefits of attachment security online, enhancing mood and buffering perceived threat in the same way as real-world physical proximity to and comfort from an attachment figure (e.g. Carnelley & Rowe, 2007).

The impact of attachment priming endures over time (Carnelley et al., 2015; Gillath & Karantzas, 2018). Specifically, an extended facilitative effect of attachment security priming has been found for mood, interpersonal appraisals, emotional well-being and attachment-related anxiety (Gillath & Karantzas, 2018). Carnelley and colleagues asked participants to write about a secure attachment bond and think about that bond again for the next 4 days. When compared against controls, this repeated security-priming group showed a maintained reduction in anxious mood over follow-up days. Taken together, the fields of adult attachment and attachment priming highlight that a person's attachment orientation can be considered '*environmentally labile*' [i.e. short-term attachment priming] as well as

'environmentally stable' [i.e. long-term attachment predisposition] (Bowlby, 1973, p. 366).

1.2.2. Guided imagery as an attachment prime. Guided imagery may be a particularly effective method for attachment priming (Gillath and Karantzas, 2018). Mikulincer and Shaver (2001) developed a secure base priming script that introduces a hypothetical threat for participants (*'Imagine yourself in a problematic situation that you cannot resolve on your own. . .'*) followed by a sense that other people in general would be attuned to their needs (*' . . . imagine that you are surrounded by people who are sensitive and responsive to your distress . . . they love you, and set aside other activities in order to assist you'*) (p. 103). Respondents are asked to rate the vividness and clarity of their visualisation. This script has been applied to investigate the impact of contextually-primed attachment in the context of dispositional attachment style and sub-clinical paranoia (Hutton, Ellett, & Berry, 2017). Interestingly, security priming predicted *elevated* paranoia levels, exclusively for those already high in attachment anxiety.

1.3. Future-focused mental imagery

1.3.1. The power of future-focused mental imagery. Mental imagery is a sensory time-travel process (Tulving, 1999) whereby a person recalls and/or adapts stored perceptual experiences to *'see with the mind's eye'* (Kosslyn, Ganis, & Thompson, 2001, p. 635; Atance & O'Neill, 2001). The demand to retrieve and manipulate sensory information from memory is highest when we construct a mental image of a situation we have not yet experienced (Baddeley & Andrade, 2000). Through this process, we can create an image of a hypothetical future event and, thus, the opportunity to pre-experience it in the here-and-now (Holmes, Geddes,

Colom, & Goodwin, 2008). Pre-experiencing is powerful: mental imagery has been linked to neurophysiological and emotional responses that simulate the real-life experience (Ji, Heyes, MacLeod, & Holmes, 2016). Indeed, imagining ourselves doing a behaviour predicts whether we ultimately enact it and more strongly than stating our intention verbally (e.g. [voting behaviour] Libby, Schaeffer, Eibach, & Slemmer, 2007; [health behaviour] Daniel, Stanton, & Epstein, 2013).

As well as shaping our behaviour, imagining a future event can increase its perceived likelihood. Imagining having a fictional disease is associated with an increased perception of the risk of going on to contract it (Cialdini, Schwartzman, & Reynolds, 1985). Cialdini et al. observed that this effect was moderated by how easy-to-imagine the disease was (i.e. the accessibility of symptoms based on prior perceptual experience). In sum, prospective imagery is an influential process that informs decision making, goal-directed behaviour and perceptions of the future (Laing, Morland, & Fornells-Ambrojo, 2016).

1.3.2. Studying future-focused mental imagery. As an internal, private process, mental imagery poses a methodological challenge for researchers (Kosslyn, Ganis, & Thompson, 2001), but a range of innovative measures have been developed and applied across a range of general population and clinical samples (e.g. [undergraduate students] MacLeod, Byrne, & Valentine, 1996; [members of the general population with consistent low mood] Pictet, Coughtrey, Mathews, & Holmes, 2011; [clinical depression] Ji, Holmes, & Blackwell, 2017; [psychosis] Laing et al., 2016).

Stöber's (2000) Prospective Imagery Task (PIT) adapts the Subjective Probability Task (MacLeod et al., 1996) to assess the speed at which respondents create future-focused mental images, in addition to their level of detail and vividness.

As in the original task, the PIT presents participants with a written list of statements that describe positive (e.g. *'you will make good and lasting friendships'*) and negative (e.g. *'you will have a serious disagreement with a good friends'*) future events. Applications of this methodology have shown that positive affect predicts the perceived likelihood of positive future events (Macleod et al., 1996), whereas higher levels of depressive symptomatology, negative affect, anxiety and worry are related to increased negative expectancies for the future ([perceived likelihood] Macleod et al., 1996; [average 'imageability' rating combining speed, detail and vividness] Stöber, 2000). Indeed, Ji, Holmes and Blackwell (2017) have found that the vividness of imagery for positive future events is related to greater optimism at baseline, as well as predicting optimism at 7-month follow-up.

1.4. Future-focused mental imagery and attachment

Prospective mental imagery methodology has been developed as a measure of attachment in both children and adults (Baldwin, Fehr, Keedian, Seidel, & Thomson, 1993; Futh, O'Connor, Matias, Green, & Scott, 2008; George & West, 2001).

Baldwin and colleagues (1993) have trialled two measures to examine relational schemata that are significantly linked to attachment style. The first of these is self-report and asks participants to imagine a scenario based on an initial item (e.g. *'you reach out to hug or kiss your partner'*) and then rate how often they would expect their partner to respond in a positive as well as a negative way (e.g. *'he/she accepts you'* and *'he/she rejects you'*). The second measure utilises an implicit lexical decision methodology. Sentence stems such as, *'if I depend on my partner then my partner will. . .'* are given on a computer screen and a single word appears afterwards. This word is related to the sentence stem (e.g. *'leave'*), unrelated (e.g.

'menu') or a non-word (e.g. 'shink'). Together, these measures ask respondents to imagine being with a partner in situations designed to represent three core relational contexts: (1) trust, (2) closeness and (3) dependency.

Futh and colleagues' (2008) Manchester Child Attachment Story Task (MCAST) uses dyadic play set-pieces to assess child-caregiver attachment. In contrast to the written stimuli for mental imagery reviewed already, the administrator provides the child with the beginning of a story using child and caregiver figures interacting in a dollhouse. These story stems include the child having a nightmare or getting lost in a shop; scenarios designed to elicit a sense of threat and thus activate internal attachment representations of self and other. The child is then invited to elaborate on these story stems, considering what the two characters may have been thinking and feeling in each scenario. The MCAST is used to determine overall attachment style by attending to the coherence and content of the completed narratives. The latter content assessment attends to factors such as how far children depict the caregiver as responsive, warm and comforting as well as the extent to which this offer of comfort is successful in alleviating distress.

George and West's (2001) Adult Attachment Projective (AAP) measure takes an analogous approach to assessing adult attachment. Just as in the MCAST, the AAP shows the participant pictures designed to evoke separation, loss and aloneness as foundational themes from attachment theory. The stimuli include pictures of a man and a woman standing with suitcases nearby, a young person sitting alone on a bench and a man looking at a gravestone. The precise context, facial expressions and actions in the pictures are deliberately ambiguous. Participants are asked to describe what is happening in each picture, including characters' thoughts, feelings and the likely conclusion to scene. In this way, both the MCAST and the AAP use materials

to stimulate hypotheses about the inner world of, as well as the future outcomes for, imaginary characters.

Therefore, researchers have harnessed future-focused mental imagery as a tool to investigate attachment. These existing measures vary, both in terms of the method used to cue prospective imagery (i.e. written, pictorial or interactive stimuli) and the way that responses are recorded (i.e. rating scale, word recognition, story stem-completion or semi-structured interview). Notably, Baldwin et al.'s measures investigate attachment within an existing romantic relationship, whereas the MCAST and the AAP relate to imagined characters. The measures reviewed above share an applied approach; they use carefully designed interpersonal vignettes to elicit attachment-related representations. Furthermore, they each include a series of these relational scenarios to enable nuanced assessment across hypothetical contexts.

1.5. Virtual reality as a tool for researching social interactions

Virtual reality (VR) environments have the advantage of allowing experimental control while offering an emotionally engaging experience. Moreover, behavioural responses in VR are appropriate as if the given situation were genuinely happening. For example, football supporters in Slater et al.'s (2013) study intervened verbally and/or physically to defend the avatar victim in a violent argument. As would be predicted in real-life, they were more likely to do so if the victim was a supporter of their team and looked towards them as if appealing for help. The authors refer to this phenomenon as the product of a double illusion: (1) the sense of being *in* the virtual world ('the place illusion') and being *part* of events as they unfold ('the plausibility illusion'). The latter highlights that virtual worlds can allow participants to interact with dynamic rather than only static stimuli. This experiential quality is

especially important when researching social interactions (Blascovich et al., 2002; Parsons, 2015).

Preliminary trials of VR therapy (VRT) further illustrate the emotionally engaging nature of virtual environments and their relationship to real-world interactions (e.g. [social phobia] Klinger et al., 2005; [persecutory delusions] Freeman et al., 2016). VRT findings show that exposure to virtual social contexts elicits sufficiently strong emotional responses to facilitate improvement in clinical symptoms and well-being. Moreover, these studies highlight the transferability of experiences during virtual interactions outside the laboratory. In Freeman and colleagues' trial, exposure to avatar characters in increasingly busy scenes while dropping safety behaviours⁵ was associated with reductions in delusional conviction. Crucially, this effect of VRT was linked to similar reduction in participants' *real-world* distress during a behavioural experiment. Thus, contemporary VRT literature emphasises the ecological validity of social interactions in virtual environments.

1.6. Virtual reality as a tool for researching attachment

Contemporary research has drawn on the ecological validity of virtual environments to explore the relationship between attachment, trust and interpersonal distance (conceptualised as an objective measure of trust behaviour; Bailenson et al., 2003). During a brief VR interaction with an avatar character, attachment security is associated with maintaining closer interpersonal distance among participants with early psychosis (Reidy, 2016), whereas insecure-dismissing attachment is associated

⁵ 'Safety behaviours' are actions that are designed to reduce a perceived threat, but in fact prevent processing of disconfirmatory evidence. They are a maintenance factor in cognitive-behavioural models of anxiety disorders (Salkovskis, 1991) and persecutory delusions (Freeman, Garety, Kuipers, Fowler, & Bebbington, 2002).

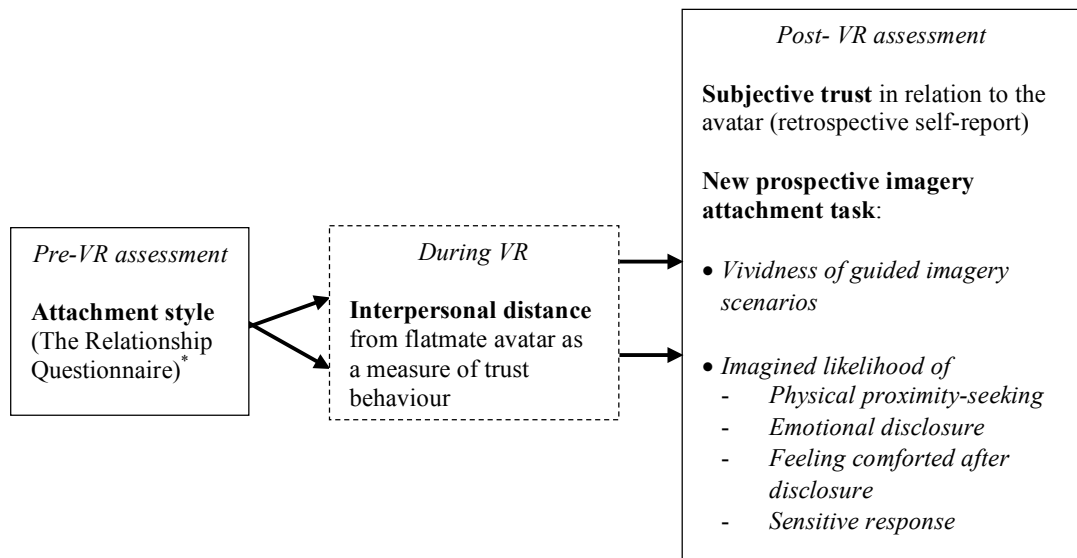
with maintaining larger distances in a general population sample (Fornells-Ambrojo et al., 2016).

In the latter study, insecure-dismissing attachment also predicted *higher* ratings of subjective trust in the avatar. The authors hypothesised that keeping physically distant from an interactional partner could be a strategy to deactivate the ABS in this attachment orientation. As dismissing attachment is defined by valuing autonomy over interdependence, interpersonal distance may function as a safety behaviour during social interactions. On the one hand, these studies highlight a significant relationship between attachment and trust during virtual interactions with an avatar stranger. On the other hand, inconsistent findings highlight that this emerging area warrants further research.

1.7. Current study

The current study used a brief VR scenario to explore the association between attachment security and subjective trust in as well as physical proximity to an avatar. A novel future-focused mental imagery task was developed to explore imagined attachment behaviours. The task's guided imagery script was informed by attachment priming research evidence for differential here-and-now activation of the ABS in response to related stimuli (Mikulincer Shaver, 2016; Carnelley et al., 2015; Norman et. al., 2015). We wanted to investigate if imagined attachment behaviours towards the avatar flatmate would be associated with pre-existing attachment and trust during the virtual interaction. Figure 1 summarises the stages of the study protocol that map onto the below research aims.

Figure 1. Diagram summarising the three main stages of the research protocol



Note. Solid line indicates self-report measure; Dotted line indicates implicit measure.

*The Relationship Questionnaire (RQ: Bartholomew & Horowitz, 1991)- detailed in full in Measures section 2.3.

1.8. Aims

1.8.1. Attachment style and trust in the virtual environment. This study aimed to investigate the association between attachment style and trust during a brief virtual encounter, replicating and extending previous work (Fornells-Ambrojo et al. 2016; Reidy, 2016).

Hypothesis a). Attachment security will predict higher subjective trust in and greater trusting behaviour (i.e. smaller interpersonal distance) towards the avatar.

Hypothesis b). Higher insecure-dismissing attachment will predict higher subjective trust as well as reduced trusting behaviour (i.e. larger interpersonal distance).

1.8.2. Attachment style and imagined attachment behaviour. The current study aimed to explore a new adult attachment-focused guided imagery task.

Concurrent validity of the novel task was evaluated in relation to the Relationship

Questionnaire (Bartholomew & Horowitz, 1991) in addition to its internal reliability. As the task was designed primarily to tap into the construct of attachment security, the research hypotheses for this aim did not focus on the other three RQ attachment styles.

Hypothesis c). In an imagined future, mildly distressing situation, attachment security will be associated with:

- *c.1:* Higher perceived likelihood of imaginal physical proximity-seeking and making an emotional disclosure to the virtual character (*Participants' own behaviour*).
- *c.2:* Higher perceived likelihood of experiencing a sense of comfort after making an emotional disclosure to the virtual character (*Participants' own emotional state*).
- *c.3:* Higher perceived likelihood of the virtual character responding sensitively to their emotional disclosure (*Participants' prediction of the avatar's behaviour*).

1.8.3. Trust in virtual reality and imagined attachment behaviour.

Hypothesis d). Higher subjective trust and trusting behaviour (smaller interpersonal distance during the VR interaction) will be associated with:

- *d.1:* Higher perceived likelihood of imaginal physical proximity seeking and making an emotional disclosure to the virtual character (*Participants' own behaviour*).
- *d.2:* Higher perceived likelihood of experiencing a sense of comfort after making an emotional disclosure to the flatmate character. (*Participants' own emotional state*).

- *d.3: Higher perceived likelihood of the avatar responding sensitively to their emotional disclosure. (Participants' prediction of the flatmate character's behaviour).*

2. Method

2.1. Design

The present study was conducted jointly with another UCL Trainee Clinical Psychologist (HD; see Appendix 6 for summary of each researcher's contribution) and was part of a larger project investigating exposure to virtual environments. As summarised in Figure 1, the central independent variable was self-reported attachment style which was assessed before the VR scenario and included in the analyses as a continuous measure. The study was designed to investigate the strength of the association between attachment and the following continuous outcomes: interpersonal distance (during VR scenario), subjective trust in the virtual character (retrospective report post-VR) and imagined attachment behaviours towards them as reported on a prospective imagery task (post-VR).

2.1.1. Participants. Participants were recruited from the general population with the inclusion criterion that they were aged 18 years or above. To limit the risk of negative side effects from using VR technology, potential participants were excluded from the study if they had a history of epilepsy. Having a mental health diagnosis was not an exclusion criterion, but those with a current clinical presentation of thought disorder or psychosis were not eligible to take part as this would have rendered the VR scenario and self-report measures unfeasible.

2.1.2. Sample size and power analysis. The power analysis for the study was conducted using G*Power3 ($\alpha = 0.05$, $\beta = 0.80$) and informed by Elenbaas'

(2013) moderate correlation (Cohen, 1992) between dismissing attachment and self-reported perception of an avatar's trustworthiness ($r = .31, p = .016$) using the same VR scenario as in the current paper. A sample of 60 participants would enable detection of a significant effect of this size with 80% power if it existed in the present dataset.

We are not aware of another study to-date that has investigated imagined attachment behaviours in relation to trust. As such, there is no existing effect size that can directly inform the power calculation for Hypothesis d). Therefore, the estimated number of participants was informed by Elenbaas' effect size which captures a link between dispositional attachment and perceived trustworthiness; an association that has relevance for each of the current research hypotheses. In practice, we recruited additional participants deliberately to enable a 'buffer' in case technological malfunctions rendered any data unusable. Seventy participants were tested in total, meaning that the current study had 95% power to detect a significant association between RQ attachment style and subjective trust.

2.1.3. Ethics. The study was given a favourable opinion by the UCL Research Ethics Committee (see Appendix 7 for the notice of approval letter). All participants were allowed time to read over the information sheet (Appendix 8) before continuing with their testing session. This outlined their right to withdraw from the study at any time as well as the minor risk of negative effects associated with using VR technology. They then gave written informed consent on two identical forms so that they were able to keep a copy for their records, along with the participant information sheet.

The VR scenario has already been used safely with samples from both the general public (Fornells-Ambrojo et al., 2016) and NHS service users (UCL

DClinPsy thesis projects: Reidy, 2016; Wingham, 2016). It is designed to be a pleasant experience. The clinical sample of service users with psychosis in the above thesis projects reported that their positive affect either increased or stayed the same from pre- to post-VR scenario, while levels of negative affect decreased.

Nevertheless, as participant well-being was integral within the study methodology, they were given a support sign-posting sheet at the end of their testing session (Appendix 9). This sheet acknowledged that the study questionnaires were of a personal nature and that, for some participants, they could raise sensitive material. It outlined information about how charities and their local GP could offer support if they were feeling distressed after taking part but felt they could not share this with a member of their social network or the research team.

2.2. Procedure

2.2.1. Participant recruitment. Participants were recruited through two platforms. We created a page for our study on the UCL Psychology and Language Sciences (PALS) Divisional Subject Pool with key study details and eligibility criteria. This website allowed us to list the dates and times when we planned to conduct testing so participants could book into the most convenient timeslot. We posted an advert for the study on social media platforms, inviting potential participants to contact a study-dedicated email address to learn more about the research. These were the King's College Mental Health Studies MSc Facebook page as well as our personal pages. We sent a confirmation email specifying participants' testing slot and giving directions to the UCL Computer Aided Virtual Environment (CAVE) as well as a reminder email the day before they were due to take part. This procedure was designed to reduce the risk of drop-out between recruitment and

participation. In total, just two participants did not attend their session to complete the study.

2.2.2. Overview of experimental procedure. Table 1 summarises the study protocol visually. Before each participant arrived at the CAVE, an online generator (Dallal, 2017; www.randomization.com) was used to randomly allocate them to either the high or low contingency condition as part of the broader study the current project is nested in. The researcher explained that the questionnaires all explored the participant's past as well as present experience of social contexts and relationships.

Table 1. *Overview of full study protocol.*

Pre-VR	VR Exercise	Post-VR
Randomisation to high or low contingency condition	Tour of CAVE and instructions for VR exercise	<i>Completion of following measures:</i>
Participant Information Sheet (and opportunity to ask questions)	Participant interviews	Subjective Trust scale [#]
Written, Informed Consent	virtual flatmate (four questions, including avatar invitation for participant to follow him to view the terrace)	Prospective Imagery Attachment Task (PIAT) [*]
Demographic details		The Positive and Negative Affect Schedule (post-VR version) [#]
Previous experience of flat sharing and VR	Interpersonal distance recorded after avatar invites participant to view terrace [#]	Sense of Presence Questionnaire [#]
<i>Completion of following measures:</i>		VR feedback measure:
Relationship Questionnaire [*]		• Detection of contingency check [#]
Childhood Trauma Questionnaire ⁺		• Attention check [#]
Brief Core Scheme Scales ⁺		
Positive and Negative Affect Schedule (pre-VR version) [#]		

Note: ^{*} = measures used by the current author only. See 'Measures' section for references for each of these measures. ⁺ = measures used by the other UCL DClinPsy trainee (HD) for her research questions, not described in this thesis. [#] = measures used by both the current author and HD.

As outlined in the Ethics section, it was acknowledged that this focus is inevitably of a personal nature and that there was no obligation to answer any questions they did not feel comfortable with. After the pre-VR assessment battery, participants completed a brief interaction with an avatar in a virtual flat-share environment followed by the post-VR measures. At the end of their testing session, participants were offered the support signposting sheet and paid £12.50 as a thank you for their time. Typically, the study took approximately 50 minutes to complete.

2.3. Virtual reality exercise

Participants were offered a break after the pre-VR questionnaires before a researcher gave them a tour of the CAVE. They had the opportunity to trial the stereo glasses and ask questions before proceeding further. The researcher explained the premise of the VR scenario: they would be 'visiting' a flat-share to meet one of the current flatmates. They would be interacting with this virtual character to explore whether they would be interested to move in. To support this interaction, participants were given a standardised sheet of questions that they would read out during the scenario. They were instructed that the flatmate would be the first to speak and that when he asked their name they should reply by introducing themselves. Their cue to ask the first question would be after he finished saying a further brief sentence ending with ". . . *I'm ready*".

The researcher assured participants that the exercise was not a test of their ability to act out the scenario, nor their memory of the scripted questions. They were advised that the interaction would follow a turn-taking pattern, so they would know to ask the next question when the avatar fell silent. Participants were told that they should explore the space as much or little as felt natural to them, but that it was important to ensure that everyone started from the same point. The researcher

positioned them facing the avatar on a designated spot in the CAVE (2 metres from the avatar). The scenario lasted for approximately 3 minutes. Afterwards, the researcher turned the lights back on and collected the participant. They also checked verbally that participants were not experiencing any negative effects from their experience of VR.

Virtual reality apparatus. The scenes of the VR exercise were displayed in an immersive projection system. High-resolution images were projected in real-time onto three back-projected wall screens (each measuring 3m x 2.2m) and a floor screen (3m x 3m). A stereo presentation of the virtual world was delivered using Lightweight CrystalEyes shutter-glasses. These glasses present separate images to the left and right eyes, producing the illusions of 3D objects within and beyond the walls of the CAVE. Therefore, it was important that the researcher warned participants that they would be likely to experience the VR space as larger than the physical space of the CAVE. To safeguard against any risk this could present, a proximity-tracking system was in place that presented a pattern on the shutter-glasses if participants came too close to the wall screens. An inertial/ultrasonic head-tracking device was mounted on the glasses, which enabled images to be presented in reference to the participants' physical orientation and viewpoint. This technology provides almost natural sensorimotor contingencies for visual perception (i.e. as participants move around, the environment projects perspective-correct information). Spatialised audio was delivered through four corner speakers.

The researcher used a wireless hand-held remote control device to progress the stages of the scenario in real-time. In particular, they used one to trigger the avatar's verbal responses to the scripted questions and another button to trigger the avatar's non-verbal response of head-nodding when participants spoke themselves.

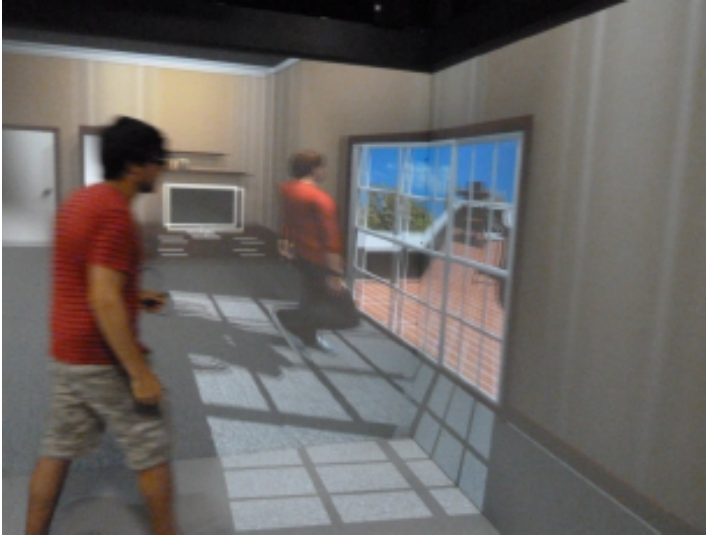
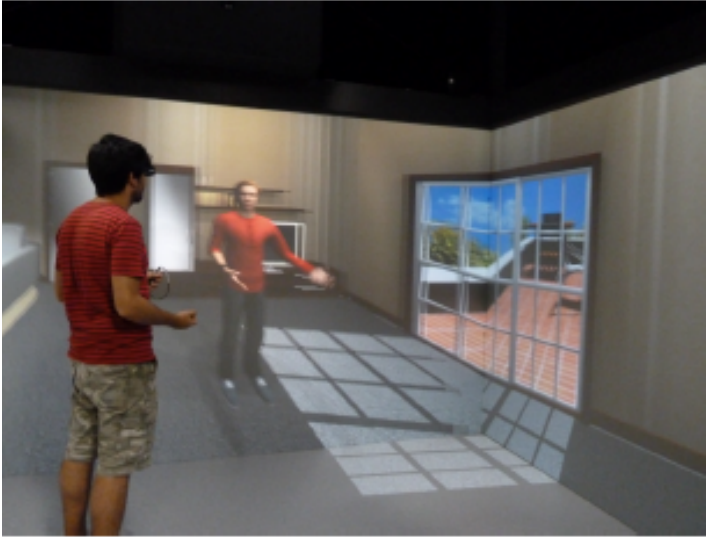
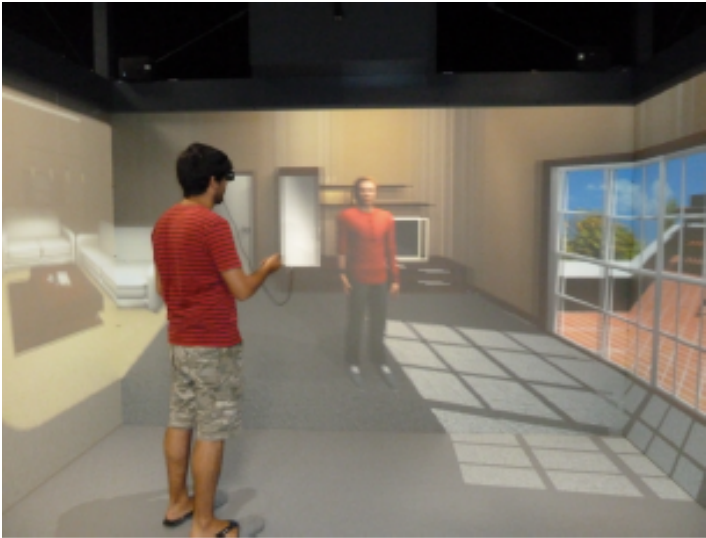
The virtual reality scenario. The VR scenario represented a modern, tidy flat-share environment (Figure 2). It was programmed by collaborators at the Department of Computer Science at UCL and the University of Barcelona with Elenbaas (2013) specifically for Fornells-Ambrojo et al.'s (2016) study and others to be conducted by this research group. The scenario was designed to be naturalistic and neither threatening nor anxiety-provoking. From the participants' perspective at the start of the exercise, there was a living room seating area in front with a wall-mounted television and neatly stacked bookshelves. To their left, there were doors leading to other rooms in the flat. To their right was a French window which looked out onto a large sunny terrace.

The avatar. The virtual flatmate, 'Mark' was present from the beginning of the scenario. He was positioned in the centre of the virtual flat which was projected onto the back wall of the VR environment. He was designed to be a young, casually-dressed White male in his early twenties. Voice and movement were pre-recorded by an actor and mapped onto the avatar. A head tracker fitted to the VR glasses allowed programming of the avatar's gaze to always be in the direction of the participant.

Throughout the scenario, Mark was programmed to blink regularly, make gestures with his arms during conversation and display subtle ambient body movements when 'listening'. These subtle movements, in addition to the manually-cued behaviours described above, were designed to create the most life-like, natural presence possible.

Virtual scenario script. Table 2 gives an extract of the conversation each participant had with the virtual flatmate (see Appendix 10 for full breakdown of the dialogue). Overall, the script consisted of 4 main parts:

Figure 2. Still images showing sequence of events during virtual interaction



- i) Greetings
- ii) Participant asks and avatar responds to questions about flat sharing
- iii) Avatar moves to the terrace and invites participant to look, conversation continues
- iv) Avatar receives an unexpected phone call and ends the meeting

Table 2. *Extract from scripted conversation between participants and the avatar: Third and fourth questions*

Participant	Mark
What makes a good flatmate?	Mhm... good question... don't know... I'm trying to thinksomeone 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
What is the best thing about this flat?	The terrace, and the view! . . .
<i>Avatar invites participant to view the terrace</i>	
	. . . come and have a look! [Avatar moves to window and gazes outside before turning back to face participant] It's amazing to have all this outside space, in the summer we practically live out here! We have great barbecues and parties and -
<i>Avatar receives unexpected phone call</i>	

When participants asked the last question, the avatar invited them to come with him to see the terrace in the virtual flat, gesturing with his arms as he spoke. After

moving closer to the terrace, Mark began to describe why he enjoys this feature of the flat but was interrupted by his mobile phone ringing. He turned slightly away from the participant to take the call briefly and discreetly. He made his apologies and explained that he would have to go, but asked if the participant could continue the meeting at another time. After pausing for the participant's response, the scenario faded out.

Contingency manipulation. The avatar's movements were programmed to be at either a low or high level of interpersonal contingency with the participant.

High contingency condition. In the high contingency condition, the avatar subtly tilted his head in the same direction when the participant tilted their head. When participants moved their head in any other way, Mark subtly moved his body either from side to side (swaying) or back and forth. The researcher pressed a button to cue the avatar to nod after the participants introduced themselves as well as every time they started asking the scripted questions to him. These contingent behaviours were programmed with a 1.5 second delay. This slight delay and the mixture of avatar responses were chosen to reduce the likelihood that the participant would experience Mark as mimicking their actions. Mimicry detection can adversely affect perceived trustworthiness of an interactional partner (Bailenson, Yee, Patel & Beall, 2008).

Low contingency condition. In the low contingency condition, the avatar was programmed to give the same responses as in the other condition, but with a longer 20-second time delay. Delayed contingent responses were used in this condition to control for the effect of overall avatar movement on trust. This was informed by existing research that investigates the relationship between degree of non-verbal

avatar mimicry and how participants evaluate them socially (e.g. likability) (Vrijssen, Lange, Dotsch, Wigboldus, & Rinck, 2010).

Table 3 gives an overview of the contingency mapping between participant and avatar responses across both contingency conditions. It is of note that, due to a change in the software platform, the execution of one of the contingent non-verbal avatar responses (body swaying) that was present in Fornells-Ambrojo et al.'s (2016) VR scenario was not applied in the present study. This resulted in a 16.3% reduction in contingent responding, relative to this earlier study. Therefore, it is important to make the caveat that, while the current study replicates Fornells-Ambrojo et al.'s research protocol, contingency mapping was not identical across the two studies (see Appendix 11 for comparison between avatar behaviours in the two studies).

Table 3: *Contingency mapping of participant behaviour and avatar responses*

Participant behaviour	Avatar responses
Participant moves head side to side (tilt)	Avatar tilts head in the same direction and returns head to original centre after participant has done so
Participant speaks	Avatar nods

2.4. Measures

As this thesis was nested within a larger study, some measures were used during the data collection phase but do not have direct relevance for the current project. For clarity, only those measures that relate to the present research questions are reported here.

2.4.1. Pre-VR measures. Before entering the virtual environment, participants completed a form that asked about their demographic details and mental health history as well as their previous experience of flat-sharing and VR (Appendix 12). Participants were then asked to complete a battery of questionnaires.

Attachment Style: The Relationship Questionnaire (RQ; Bartholomew & Horowitz, 1991). The RQ is a brief self-report measure of adult attachment style (Appendix 13). It includes a brief description of four adult attachment styles: secure ('Style A'), insecure-fearful ('Style B'), insecure-preoccupied ('Style C') and insecure-dismissing ('Style D'). For example, the secure attachment profile is outlined as: *'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.'* Participants are asked to indicate which description best describes their general style of relating to others. They also rate on a 1 ('disagree strongly') -7 ('agree strongly') scale how far each of the four styles applies to them. The RQ has been found to show good construct, convergent and discriminant validity (Griffin & Bartholomew, 1994).

State Affect: Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS (Appendix 14) was used to check for any change in participants' positive or negative state affect during the VR scenario. Hence, they were asked to complete the PANAS as the last measure in the pre-VR battery and immediately after finishing the VR exercise. It is a 20-item self-report questionnaire that asks respondents to rate how they feel *'right in this present moment'* on a 5-point scale for each emotion; from 1 ('very slightly or not at all') – 5 ('extremely'). The PANAS can be used to generate two independent sub-scale scores;

positive affect (e.g. 'excited', 'inspired') and negative affect (e.g. 'scared', 'hostile'). It is characterised by both good reliability and validity (Crawford & Henry, 2004).

2.4.2. Trust behaviour: Interpersonal distance from the avatar in virtual reality. We examined the mean distance the participant maintained from the avatar during the key phase of the VR scenario after he invited them to view the terrace with him. This outcome was conceptualised as an objective measure of trusting behaviour (Bailenson, Blascovich, Beall, & Loomis, 2003).

2.4.3. Post-VR measures.

Concentration on VR interaction: Attention check. Participants were asked two questions with a 'true-false' response format to ensure that they directed sufficient attention to the avatar during the scenario (Appendix 15). These assessed whether they had been listening to the avatar's responses to their questions about flat-sharing. This was important because we were aware of the risk that participants could get distracted by 'testing out' the novel VR technology, to the detriment of engaging with the interaction that was central to the study.

Sense of presence in VR: The Sense of Presence Questionnaire. Slater and colleagues' (Slater, Steed, McCarthy & Maringelli, 1998; Appendix 16) 6-item measure was used to assess the extent to which participants felt present in the virtual flat, as opposed to the physical location of the CAVE (e.g. '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'). Participants rated each item on a 7-point Likert scale with a higher score indicating a greater sense of presence in the virtual flat.

Subjective trust: Subjective trust scale. Participants' feelings of trust towards the avatar were assessed retrospectively using the single item Likert-scale applied by

Fornells-Ambrojo et al. (2016). They were asked: ‘*How trustworthy did Mark seem?*’) on a 7-point scale (from 1 = ‘not at all’ to 7 = ‘very much’) (Appendix 17).

Imagined attachment behaviours: Prospective imagery attachment task (PIAT). A prospective imagery-based measure was developed for the current study. It built upon participants' experience in the virtual environment to explore imagined attachment behaviours. The standardised script for the PIAT was designed to extend the VR experience by guiding participants to imagine a hypothetical future scenario in which they have moved into the flat and been Mark's flatmate for some months (Appendix 18 for full script). The scenes described in the task are designed deliberately to access the proximity seeking, distress signalling, comfort-seeking and response sensitivity that form the crux of the adult attachment bond (Crowell & Waters, 2006; Hazan & Shaver, 1994). The guided imagery script relates to the avatar that participants 'met' and the flat-share environment they 'visited' in VR. It was hoped that this recent experience would offer a richer stimulus for mental imagery than verbal instructions alone.

The standardised PIAT script is read aloud and respondents give their ratings verbally. They are invited to close their eyes while the researcher follows the script to provide detailed information for each scenario. Respondents are instructed to picture ‘*each future scenario . . . in as much detail as possible so that they look like a film playing in your mind*’. This accessible analogy of watching a film was informed by Hackmann, Surawy and Clark's (1998) methodology for exploring spontaneously occurring mental images (also applied in Laing et al., 2016). Hence, using VR as the basis for the task scenarios, the prompt for participants to close their eyes and the film metaphor are all techniques designed to scaffold the ability to generate mental images (Sherman, Cialdini, Schwartzman, & Reynolds, 1985).

Respondents are first given the opportunity to practice the process of creating a mental image (*'Imagine yourself watching television while sitting on a sofa, just like the one you saw in Mark's flat'*). They are asked to describe what they can see in the mental scene through their own eyes to ensure that they are creating images from a field, rather than observer, perspective.

Second, the PIAT introduces a mildly distressing situation. Specifically, it guides respondents to imagine hearing that they have not been successful in a recent interview for a job they wanted. This scenario was designed deliberately to be a 'threat' that activates participants' ABS (Mikulincer & Shaver, 2016), without being excessively upsetting. It was important to select a non-interpersonal stressor. A social threat may have risked biasing responses to the subsequent attachment-orientated items.

Third, the script moves on to the core items of the imagery task. These map onto Hazan and Shaver's (1994) dimensions of the secure adult attachment bond (Table 4). In sum, the PIAT guides respondents to imagine the extent to which they would: seek physical proximity to the virtual flatmate, seek support from him by disclosing their distress, experience comfort after making this disclosure and anticipate a sensitive response from him.

To allow comprehensive assessment in each area, the PIAT guides participants to imagine responding in two contrasting ways for each scenario. For example, for the physical proximity dimension, they are asked to imagine themselves going to their bedroom to be alone. Then, they are asked to imagine choosing to approach Mark and sit down next to him instead. This design was informed by Mikulincer and Arad's (1999) existing attachment-focused imagery task which asks participants to imagine themselves in a distressing situation and report how they would expect their

Table 4. *Guided script for the Prospective Imagery Attachment Task (PIAT)*

Item Name*	Adult Attachment Construct	Excerpt from Script
<i>Establishing the Context</i>		
Establishing a Positive Future Relationship with Mark	To what extent does the participant view Mark as a potential adult attachment figure in the hypothetical future scenario?	<i>'You have been flatmates for a few months. You get on with him and things in the flat are going well. Imagine yourself sitting on the sofa and watching your favourite TV show together one evening . . .'</i>
Establishing a Sense of the Threat	Anxiety and distress are the primary activators of the attachment behavioural system across the life span. To what extent is the participant able to imagine a mildly distressing hypothetical scenario?	<i>' . . . you get a call from the interview panel. They tell you that you have not been successful and that they have offered the job to another candidate. The call has just ended. Imagine that, as you put your phone away, you feel sad at missing out on the job and worried about the future '</i>
<i>Assessing Imagined Attachment Behaviours towards Mark</i>		
Seeking Physical Proximity	When faced with a stressor, to what extent does the participant seek physical proximity to and resist separations from Mark?	<i>'You look across the living room and, through the glass doors, you see Mark sitting outside at the table on the terrace. Imagine walking into to your bedroom because you want to be alone. How vivid is the image in your mind? How likely is it that you would go to your bedroom to be alone like this?'</i> <i>' . . . this time, imagine walking over to the terrace to sit down next to him. How vivid is the image in your mind? How likely is it that you would go over to sit down next to Mark like this?'</i>

Table 4 (Continued). *Guided script for the Prospective Imagery Attachment Task (PIAT)*

Item Name*	Adult Attachment Construct	Excerpt from Script
<i>Establishing the Context</i>		
'Safe Haven'/Comfort Seeking: Emotional Disclosure	When faced with a stressor, to what extent does the participant turn to Mark for comfort, support and reassurance?	<p><i>' . . . you and Mark are both sitting on the sofa in the living room watching TV. Mark asks you: "how was your day?" The memory of the phone call with the interviewer comes back into your mind.</i></p> <p><i>Imagine that you choose not to share your upsetting news about the job and simply reply to Mark by saying "my day's been ok"</i></p> <p><i>How vivid is the image in your mind?</i></p> <p><i>How likely is it that you would choose not to share your upsetting news with Mark like this?'</i></p> <p><i>' . . . Imagine that, this time, you reply to Mark by confiding in him. You tell him that you are feeling disappointed and worried about what to do next because you had really hoped to get that job</i></p> <p><i>How vivid is the image in your mind?</i></p> <p><i>How likely is it that you would confide in Mark like this?'</i></p>
Feeling Comforted after Emotional Disclosure of Distress	How does the participant anticipate that opening up to Mark will impact their level of distress (i.e. the likelihood of feeling comforted)?	<p><i>'Imagine that you have just finished describing the upsetting news about the job to him. How likely is it that you would feel comforted after opening up to Mark?'</i></p>
'Safe Haven': Anticipated Sensitivity of Response	To what extent does the participant anticipate that Mark would respond sensitively or insensitively to their distress?	<p><i>'Imagine that, after you open up to Mark about not getting the job, you notice that . . .</i></p> <p><i>. . .he seems distracted by the TV. He doesn't look like he has paid full attention to what you have just said.</i></p> <p><i>How vivid is the image in your mind?</i></p> <p><i>How likely is it that Mark would seem distracted after you had opened up like this?'</i></p> <p><i>' . . . This time, imagine that he gives you his full attention, saying things that are supportive and encouraging.</i></p> <p><i>How vivid is the image in your mind?</i></p> <p><i>How likely is it that Mark would respond in a supportive way after you had opened up like this?'</i></p>

Note. Items in grey were important in establishing the attachment-focus of the task, but not central to the hypotheses and planned data analyses.

*Informed by Hazan and Shaver's (1994) 'Defining features of attachment' model.

romantic partner to respond. Crucially, their task then presents vignettes about the partner's response; one congruent and another incongruent with the participant's expectation of this attachment figure. The PIAT 're-sets' the scene in between the two options: *'I would like you to rewind this scenario to the point where you walk through the front door of your flat. . .'*. This strategy is a further application of Laing et al.'s film analogy and was intended to facilitate exploration of both options while still maintaining the narrative flow of the script.

Following existing prospective imagery methodology (MacLeod, et al., 1996; Laing et al., 2016), the PIAT asks respondents to rate the perceived likelihood as well as vividness of each hypothetical scenario. These became the key variables in the present statistical analyses. In their review, Pearson et al. (Pearson, Deepröse, Wallace-Hadrill, Heyes, & Holmes, 2013) identify vividness as central to the subjective experience of a mental image, capturing its luminosity, clarity and similarity to first-hand perceptual experience. Baddeley and Andrade (2000) venture three criteria that must be in place before a respondent can generate a vivid mental image: sufficient relevant sensory information stored in memory, the maintained memory for these experiences and the perception that more information about the image could be retrieved if called upon. Vividness is defined clearly at the start of the PIAT, in view of it presenting a nuanced and perhaps unfamiliar concept. The following definition is given verbally and available on a written visual aid sheet throughout the task: *'how clear and distinct the image appears in your mind. How similar is it to seeing something in real life?'*

Respondents are asked to rate the vividness and likelihood of each scenario on a 0-100 ('not at all'-'extremely' scale). This was informed by the numerical scale for likelihood and vividness applied in an existing imagery generation study (Laing et

al., 2016). This 0-100 scale was chosen in favour of MacLeod et al.'s 7-point scale due to the novelty of the PIAT; it was thought that a larger continuum of possible responses would enable clearer observation of any between-respondent differences.

Laing and colleagues calculated mean likelihood and vividness scores for each participant. The current study followed this method for vividness scores, however there was a key distinction for likelihood ratings. Laing et al.'s research focused on positive future-orientated imagery exclusively, whereas the PIAT includes a range of scenarios to represent a negative as well as positive valence. Thus, vividness was used in the current study as a measure of participants' overall ability to create mental images and, thus, as a gauge of the task's feasibility. Likelihood ratings were expected to fluctuate systematically according to the valence of the PIAT scenarios. Therefore, perceived likelihood of the future-focused attachment scenes was the primary variable of interest.

In the current study, participants were asked for their feedback after completing the PIAT. To reduce the risk of social desirability bias, they were not informed that a member of research team had designed it. Responses to this open-ended question about their experience of completing the task were transcribed by a researcher.

2.5. Planned data analysis

All analyses were conducted in SPSS Version 24. The Bonferroni correction was applied for the key analyses to minimise the risk of Type I error where multiple testing was conducted.

2.5.1. Attachment style and trust in the virtual environment. Correlational analyses were conducted to investigate Hypotheses a) and b) regarding the extent to

which the continuous secure and insecure-dismissing RQ attachment styles were associated with self-reported trust in the avatar flatmate as well as trusting behaviour towards him (average interpersonal distance).

2.5.2. Attachment style and imagined attachment behaviour in the prospective imagery task. Hypothesis c) was also tested using correlational analyses. These explored whether dimensions of the PIAT that are designed to represent core constructs of adult attachment do in fact relate to the continuous measures of secure and insecure-dismissing attachment on the RQ. To ensure continuity across the analyses, both the secure and insecure-dismissing RQ attachment scales were examined. However, as the PIAT is designed primarily to capture the degree of participants' attachment security, associations with the insecure-dismissing scale are reported in Appendix 19.

2.5.3. Trust in the virtual environment and imagined attachment behaviour in the prospective imagery task. Correlational analyses were used to explore Hypothesis 4. Bivariate correlations examined the associations between responses on the PIAT and the subjective trust scale as well as trust behaviour.

2.6. Data screening

All measures relevant to the current thesis were completed by all participants. These data were screened for normality and outlier values. Histograms, significance levels on the Kolmogorov-Smirnov test, values of skewness and kurtosis in addition to box plots were applied to inspect each of the variables included in the data analysis plan.

The skewness and kurtosis of all but one of the variables (post-VR PANAS negative affect sub-scale [kurtosis only]) were below the 1.96 threshold for inferring

a non-normal distribution (Field, 2009). However, the Kolmogorov-Smirnov tests showed a significant difference from normality for all but three of the measures (pre-VR PANAS positive affect sub-scale, PIAT average vividness and PIAT likelihood of seeking physical proximity; see Appendix 20 for full breakdown of normality test statistics). Further, inspection of the box plots indicated outlier values for many of these key variables. Therefore, it was decided that non-parametric analyses would be applied where one or more variables were characterised by a non-normal distribution.

3. Results

3.1. Participants

3.1.1. Demographics. In response to the recruitment adverts on the UCL PALS Participant Pool and social media, 87 people expressed an interest in taking part in the study. Figure 3 delineates the flow of these potential participants, either into the final sample or the reasons for their non-participation. Ultimately, 70 participants took part in the study.

As summarised below in Table 5, the average age of the sample was 26 years old (SD = 8.56 years) and the majority of participants were female (64%). A range of ethnicities were reported among the sample, with Asian participants making up nearly 40% of the group and the combined White British/'White Other' group making up nearly 30%. The 'Other' category reflects the ethnicities that were represented by three participants or less. Over half of participants were either undergraduate or postgraduate students (57%) and 70% had experience of using VR technology prior to taking part in the study. Most of the sample had lived in a shared flat before

(84.3%). Two of the sample (2.9%) reported that they had a history of mental health difficulties.

Figure 3. *Flow diagram of participant recruitment*

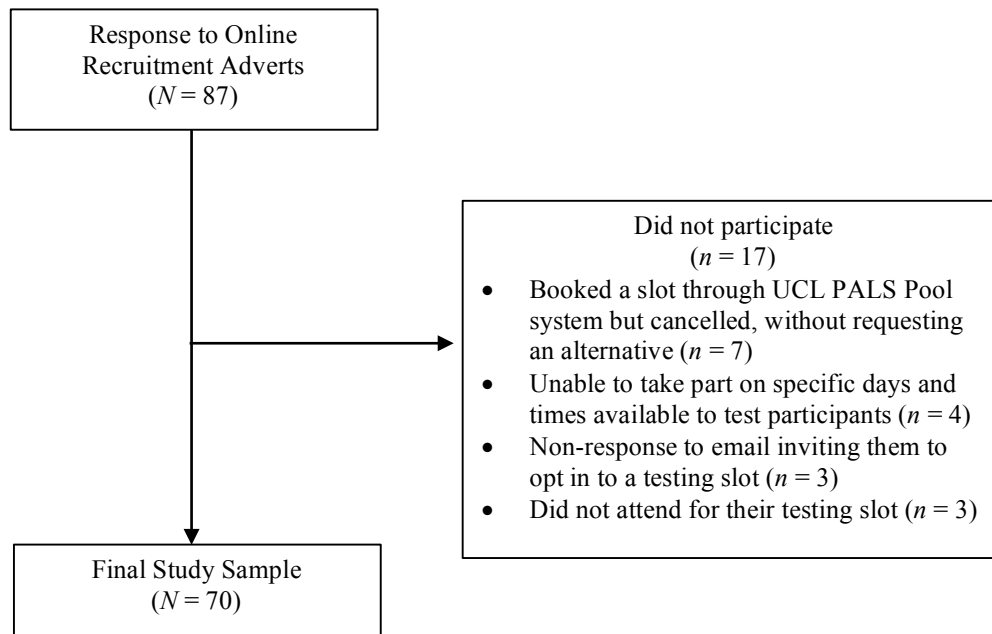


Table 5. *Key sample demographics*

Demographic	Summary Statistic
Age, mean (SD)	26.09 (8.56)
Gender, n (%)	
Female	45 (64.30%)
Ethnicity, n (%)	
Asian	27 (38.57%)
White British or 'White Other'	20 (28.57%)
African	3 (4.29%)
Indian	3 (4.29%)
Other	17 (24.29%)
Employment, n (%)	
Student*	40 (57.14%)
Employed	24 (34.29%)
Unemployed or Retired	6 (8.57%)

*'Student' includes both undergraduate and postgraduate studies.

3.1.2. Descriptives: Relationship Questionnaire. Table 6 reports the descriptive statistics for participant responses on categorical and continuous items on the RQ. Secure attachment was the most common categorical RQ style (38.57%). Participants also rated themselves as higher on the continuum measure of this attachment style, relative to the other three styles ($M = 4.83$, $SD = 1.55$). In accordance with a dimensional understanding of attachment, the latter continuous measures were applied for the analyses going forward (Fraley, & Waller, 1998; Griffin & Bartholomew, 1994).

Table 6. Overall scores on Relationship Questionnaire (RQ)

RQ Score Type	Attachment Style			
	Secure (Style A)	Insecure		
		<i>Fearful</i> (Style B)	<i>Preoccupied</i> (Style C)	<i>Dismissing</i> (Style D)
Categorical <i>N</i> (% of total sample)	27 (38.57%)	16 (22.86%)	10 (14.29%)	17 (24.29%)
Continuous* <i>M</i> (SD)	4.83 (1.55)	3.76 (1.78)	3.73 (1.83)	4.10 (1.83)

* Possible range on the RQ continuous measures of attachment is 1-7.

3.2. The virtual reality scenario

3.2.1. Feasibility: Sense of presence and attention checks. Across the six scales designed to assess participants' sense of presence in the VR scenario, the mean sense of presence was 26.09 ($SD = 6.73$). As the possible range for total scores was 6-42, we can infer that the sample experienced a moderate sense of presence or immersion in the VR world overall. The majority of participants (80%) answered both true-false attention check questions correctly, indicating that they were focusing on the interaction with the virtual flatmate during the scenario.

3.2.2. Safety and acceptability. There were no adverse events during data collection for the study. At least one researcher was present for the duration of all testing slots in the CAVE and no participant reported side effects from using the VR technology or distress in relation to any of the self-report questionnaires. There was a marginal increase in mean positive affect immediately after participants' experience in the VR scenario (Pre-VR = 32.84, SD = 7.36; Post-VR = 33.39, SD = 9.139). There was also a slight decrease in negative affect from pre- (M = 12.97, SD = 3.04) to post-VR (M = 11.57, SD = 2.27). These pre- and post-VR PANAS scores are comparable to those observed by Fornells-Ambrojo et al. (2016). Non-parametric Wilcoxon signed-rank tests indicated that the change in mean positive affect was non-significant ($Z = -.940, p = .347$) but the reduction in negative affect was significant ($Z = -4.18, p = .000$). These data would support the conclusions that the VR scenario was not distressing for participants and may have been a mildly pleasant experience.

3.2.3. Interpersonal distance and subjective trust. As outlined in the 'Virtual reality exercise' section (2.3.), participants were positioned 2 metres from the avatar at the start of the VR scenario in order to standardise baseline distance. The average interpersonal distance that participants maintained from the avatar towards the end of the interaction (i.e. during the time by the window after he invited them to follow him and look at the terrace) was 1.43 m (Standard deviation [SD] = 0.39m). These summary statistics for interpersonal distance are consistent with those observed by Fornells-Ambrojo et al. (2016) in their highly similar study design (M = 1.43m, SD = 0.26m).

On the 1-7 subjective trust scale completed after the VR scenario, the sample mean for how trustworthy the avatar flatmate seemed was 4.61 (SD = 1.49, Range =

2-7). This average level of subjective trust is marginally lower than that reported by Fornells-Ambrojo and colleagues ($M = 4.87$, $SD = 1.07$, $Range = 2-7$). The non-parametric correlation between interpersonal distance from the avatar in VR and retrospectively rated trust was significant and negative ($r_s = -.26$, $p = .03$), indicating that finding the avatar more trustworthy was associated with standing closer to him.

3.2.4. Contingency, interpersonal distance and subjective trust. Half of participants were randomly allocated to the high contingency version of the VR scenario and half were allocated to the low contingency condition. As expected, participants allocated to the highly contingent condition were exposed to a higher number of avatar movements (High contingency condition mean rank = 52.29, Low contingency condition = 18.71, $U = 25.00$, $p = .00$). Therefore, as in Fornells-Ambrojo et al.'s study, ANCOVAs were conducted to compare the subjective trust as well as the interpersonal distance outcome between conditions, covarying for total avatar movements. As this is a parametric statistical test, findings were interpreted with caution. Neither condition ($F(1, 69) = 3.61$, $p = .062$) nor total avatar movements ($F(1, 69) = 2.82$, $p = .098$) were significantly related to subjective trust. Avatar movement was significantly related to interpersonal distance from the avatar ($F(1, 69) = 15.44$, $p = .000$). There was also a significant effect of contingency condition after controlling for this covariate ($F(1, 67) = 11.62$, $p = .001$).

The role of contingency manipulation as a factor that could influence subjective trust in and interpersonal distance from the avatar was not relevant to the primary aims of the current research. Therefore, this is not included in the body text that outlines the study's central hypotheses. However, please see Appendix 21 for a summary of the main analyses covarying for contingency manipulation and total avatar movement.

3.3. Attachment style and trust in the virtual environment: Hypotheses a) and b)

Neither Hypothesis a) nor b) were supported by the data. Attachment security was not significantly correlated with subjective trust ($r_s = .19, p = .109$) or average interpersonal distance following the invitation to view the terrace (Secure: $r_s = -.20, p = .095$). Similarly, the extent to which participants identified with an insecure-dismissing attachment style was not significantly associated with interpersonal distance ($r_s = -.03, p = .801$). However, insecure-dismissing attachment was significantly correlated with lower self-reported trust in the avatar ($r_s = -.27, p = .026$). It is important to note that this association no longer retained significance once the Bonferroni correction was applied ($\alpha_{\text{altered}} = (.05/4) = .013$). Therefore, we can infer little or no support for Hypothesis b) given that the predicted association had been in the opposite direction, as informed by Fornells-Ambrojo et al. (2016).

3.4. The prospective imagery attachment task: Descriptives, reliability, feasibility and acceptability

3.4.1. Refining the PIAT: Composite likelihood ratings. In the main part of the task, participants rated the perceived likelihood of one version of a scenario and then an alternative conclusion to the same scenario: physical proximity seeking (choosing to be alone vs. joining their flatmate), emotional disclosure (choosing not to disclose distress vs. disclosing distress) and meeting a sensitive response after this disclosure (their flatmate is distracted vs. attentive). Significant negative Spearman's correlations within each scenario supported the decision to cluster together the two hypothetical responses as both theoretically and statistically meaningful (Physical proximity seeking $r_s = -.318, p = .007$; Emotional disclosure $r_s = -.462, p = .000$;

Anticipated sensitivity of response $r_s = -.581, p = .000$). Each of these coefficients retained their significance after the Bonferroni correction ($\alpha_{\text{altered}} = (.05/3) = .017$).

For all subsequent analyses, these six items were examined as three composite likelihood variables: physical proximity seeking ((join + reverse scored choice to be alone)/2), emotional disclosure ((share + reverse scored not share)/2) and anticipated response ((sensitive + reverse scored insensitive)/2). Table 7 summarises the sample mean for each of these composite PIAT scores, in addition to the imagined likelihood of feeling comforted after emotional disclosure to the avatar. Based on skewness and kurtosis levels, in addition to the K-S test and box-plot inspection, it was observed that only the perceived likelihood of feeling comforted following emotional disclosure was non-normally distributed (see Appendix 20).

3.4.2. Descriptive statistics. Planned non-parametric analyses showed that vividness ratings were significantly and positively inter-correlated throughout the PIAT scenarios (see Appendix 22). The average vividness rating was 68.30 (SD = 10.99) out of a possible 100 with a range of 40-98.89. This mean is marginally higher than that observed in Stöber's (2000) general population sample (0-30 scale: Positive future images $M = 20.26$ [SD = 3.60]; Negative future images $M = 15.93$ [SD = 3.45]). This would suggest that, overall, participants were able to bring to mind future-focused scenarios that were moderately close to how they would appear in real life.

The task was designed to explore prospective attachment behaviours which are elicited in contexts of distress/threat. Thus, it is important to note that the sample was able to create a mental image of the mildly distressing scenario that was both vivid ($M = 73.50, SD = 13.87$) and perceived as highly likely ($M = 80.56, SD = 21.77$).

The sample as a whole perceived making an emotional disclosure about their distress

as the most and experiencing comfort after doing so as the least likely ($M = 59.94$, $SD = 18.80$; $M = 48.21$, $SD = 21.28$, respectively). However, closer inspection indicates that there was substantial between-participant variation for each of the key variables, with a range of up to 90 on the likelihood scale.

3.4.3. Internal reliability analysis. Although trialled here with a modest sample size and a small number of items, the initial internal reliability of the PIAT was explored (see Table 7 for inter-item statistics and Table 8 for item-total statistics).

Table 7. *Prospective Imagery Attachment Task: Descriptive statistics and inter-item correlations*

PIAT Likelihood Item	Mean (SD) [Range]	Inter-Item Correlations			
		Physical Proximity Seeking	Emotional Disclosure	Feeling Comforted after Disclosure	Anticipated Sensitivity of Response
Physical Proximity Seeking	48.25 (19.92) [0- 90]	-			
Emotional Disclosure	59.94 (18.80) [15.50-95]	.428**	-		
Feeling Comforted after Disclosure	48.21 (21.28) [10-100]	.240*	.485**	-	
Anticipated Sensitivity of Response	53.75 (17.79) [10-100]	.111	.328**	.567**	-

Note. ** = significant associations within the threshold set by the Bonferroni correction ($\alpha_{\text{altered}} = (.05/6) = .008$).

* = significant association under the $p = .05$ threshold.

As the 'Feeling Comforted after Disclosure' item was non-normally distributed, all coefficients involving this variable are non-parametric (r_s). All other coefficients represent parametric Pearson's r correlations.

This approach follows the stance that a task's reliability naturally varies across studies due to characteristics of the respondents as well as its implementation

and, thus, can be assessed after a single administration (Green et al., 2016). Overall, the final four composite items had acceptable reliability (Cronbach's $\alpha = .70$) when compared against Kline's (2013) parameters for inferring a reliable scale designed for social science data.

Table 8. *Prospective Imagery Attachment Task: Item-total statistics*

PIAT Likelihood Item	Corrected Item-Total Correlation	Cronbach's α if Item Deleted
Physical Proximity	.323	.726
Emotional Disclosure	.569	.574
Feeling Comforted	.492	.551
Sensitive Response	.453	.647

3.4.4. Feasibility and acceptability. All participants were able to give a vividness and likelihood rating as well as a first-person description of the scene during the practice and thus, all were able to complete the PIAT in full. The task took approximately 5 minutes to complete. Afterwards, the researcher explained to participants that the task was new for the current study and that their feedback would be welcomed.

How challenging was it to imagine the scenes? A review of responses highlighted that the most common source of feedback was that the scenarios were 'easy to imagine' ($n = 20$). Those who gave a basis for this opinion identified the following reasons: their own imaginative personality, the prompt to close their eyes during the task, the descriptive nature of the guided imagery script or the everyday relatability of the scenarios in the task. Seven participants reported that it had felt difficult to imagine the scenarios, with reasons including: the challenge of taking a first-person perspective, the confusing process of moving between different scenarios

and a lack of realism because they could not picture themselves choosing to move in with Mark.

VR as a foundation for mental imagery. Six participants reported that their responses on the task were informed by their experience of meeting the avatar in VR. For some, this link was positive because they found him *'warm', 'trustworthy'* or *'likeable'* so they felt better able to imagine living with him. For others, they expressed that they experienced him as *'untrustworthy'* or *'weak'* and that this shaped their PIAT ratings. A further six respondents reported specifically that seeing him and the flat in VR enhanced their ability to imagine the guided imagery scenarios. Some of these participants explained that they found it easier to imagine the task scenarios that were set in the flat's living room (where the VR paradigm took place), as opposed to the scenarios that asked them to build a mental image *'from scratch'* (e.g. being in their bedroom in the flat).

Likelihood and vividness. For five of the participants, their PIAT likelihood and vividness ratings felt closely linked. They either reported that it was easier to create a vivid mental image of scenarios they perceived as more likely, or they found it challenging to separate the two concepts in their mind. Six shared that they had found it challenging to conceptualise and/or quantify vividness in particular.

Affective experience of the task. For one participant, the scenario designed to elicit a mild level of distress (*'... you get a call from the interview panel. They tell you that you have not been successful'*) felt mildly *'upsetting'* because this closely mirrored their recent real-world experience of a job interview. Others ($n = 9$) described their affective experience of the task as *'calming'*, with some likening the guided imagery script to mindfulness or meditation. Among these participants were

those who suggested that this task was a positive way to conclude the study's assessment battery.

3.5. Attachment style and imagined attachment behaviour (Hypothesis c)

Table 9 details the non-parametric correlations between the extent to which participants identified with a secure attachment style and the key PIAT scenarios.

Table 9. *Correlation matrix for Prospective Imagery Attachment Task likelihood items and attachment security*

PIAT Likelihood Items	Attachment Security	
	r_s	p
Physical Proximity Seeking	.379 ^{***#}	.001
Emotional Disclosure	.317 ^{**#}	.008
Feeling Comforted after Emotional Disclosure	.332 ^{**#}	.005
Anticipated Sensitivity of Mark's Response	.249 [*]	.038

Note. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$, # significant associations within the threshold set by the Bonferroni correction ($\alpha_{\text{altered}} = (.05/4) = .013$).

As attachment security was non-normally distributed, all coefficients represent non-parametric correlations (r_s).

It is notable that, under the standard alpha level of $p \leq .05$, all four of the central items from the PIAT were significantly and positively associated with attachment security. When the Bonferroni correction was applied ($\alpha_{\text{altered}} = (.05/4) = .013$), the moderate-sized effect of perceived likelihood of seeking physical proximity ($r_s = .379, p = .001$) and making an emotional disclosure to ($r_s = .317, p = .008$) as well as feeling comforted by the flatmate ($r_s = .332, p = .005$) all retained their statistical significance.

3.6. Trust in virtual reality and imagined attachment behaviour (Hypothesis d)

Non-parametric correlational analyses were used to explore the hypothesised links between the PIAT likelihood items and responses to the avatar during (interpersonal distance) and after (subjective trust) the VR scenario (see Table 10).

Table 10. *Correlation matrix for Prospective Imagery Attachment Task likelihood items, subjective trust and interpersonal distance*

PIAT Likelihood Item	Subjective Trust		Average Interpersonal Distance ⁺	
	r_s	p	r_s	p
Physical Proximity Seeking	.000	1.00	-.003	.981
Emotional Disclosure	.332 ^{**#}	.005	-.192	.112
Feeling Comforted after Emotional Disclosure	.255 [*]	.033	-.356 ^{**#}	.002
Anticipated Sensitivity of Mark's Response	.231	.054	-.191	.114

Note. ^{*} $p \leq .05$, ^{**} $p \leq .01$, [#] significant associations within the threshold set by the Bonferroni correction ($\alpha_{\text{altered}} = (.05/8) = .006$).

⁺Average Interpersonal Distance = mean distance from the avatar in phase of VR scenario after he invites the participant to view the terrace of the flat with him.

The perceived likelihood of opening up to Mark about work-related distress was unique in its significant and positive correlation with subjective trust ($r_s = .332$, $p = .005$). The perceived likelihood of feeling comforted after making this emotional disclosure was the only task item to be significantly associated with interpersonal distance ($r_s = -.356$, $p = .002$). The closer participants stayed to the avatar in VR, the greater the imagined sense of comfort after opening up to him. These two findings remained significant even under the more stringent threshold required by the Bonferroni correction ($\alpha_{\text{altered}} = [.05/8] = .006$). It is notable that there was also a trend towards significance for the correlation between feeling comforted following an imagined emotional disclosure and subjective trust ($r_s = .255$, $p = .033$).

4. Discussion

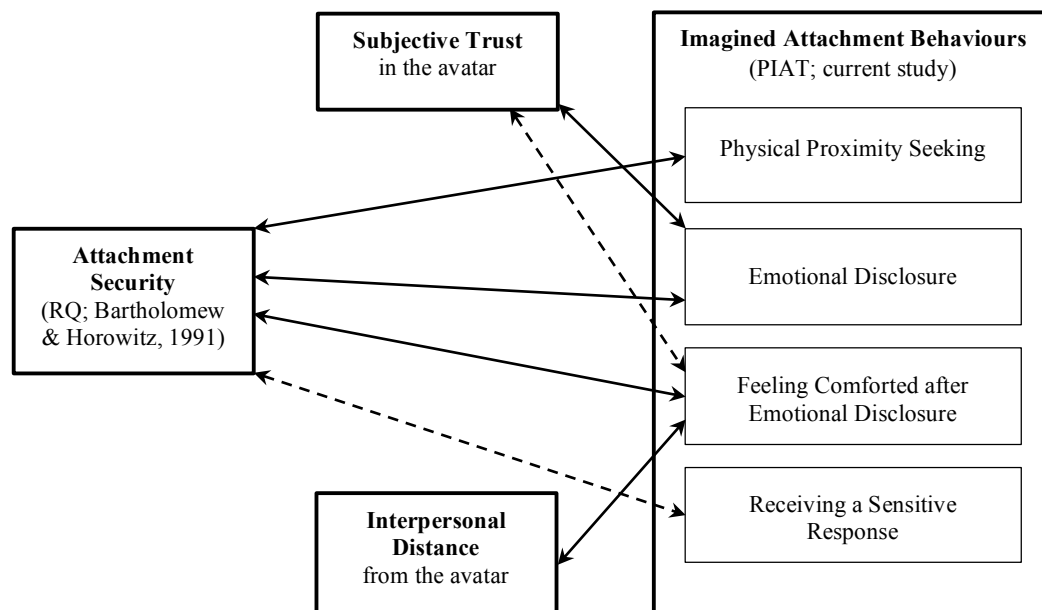
4.1. Summary of findings

The current study aimed to replicate previous research looking at the relationship between attachment style and trust during a virtual encounter (Fornells-Ambrojo et al., 2016; Reidy, 2016). Beyond this replication, the main focus of the paper was to investigate imagined attachment behaviours using a novel guided imagery task designed to extend participants' virtual interpersonal experience. Given that the PIAT was designed specifically for the present study, the research aims included assessing its internal reliability, feasibility and acceptability among a general population sample as well as exploring its concurrent validity with a well-established attachment measure (RQ; Bartholomew & Horowitz, 1991).

Dispositional attachment orientation predicted performance on the PIAT. Attachment security was associated with a greater imagined likelihood of seeking proximity, making an emotional disclosure to and feeling comforted by the avatar. Attachment security was also positively correlated with the perceived future likelihood that he would respond sensitively to their distress, but this association fell outside the more stringent threshold for significance under the Bonferroni correction.

Experiencing the avatar as trustworthy *during* the virtual interaction was linked to a higher perceived likelihood of making an emotional disclosure to him *in the future* and feeling comforted after doing so, but only the former association remained significant when correcting for multiple statistical tests. Staying closer to the avatar during the virtual exchange was associated with a higher perceived likelihood of feeling comforted after making a future emotional disclosure. Attachment security was not significantly associated with either subjective trust in or physical proximity to the avatar. Figure 4 summarises these findings visually.

Figure 4. *Visual summary of key significant correlational findings*



Note. Double-headed arrows represent a correlation between variables. Solid arrow = coefficient retained significance under Bonferroni correction. Dotted arrow = coefficient $p < .05$ but did not retain significance under Bonferroni correction.

4.2. Interpretation of findings

4.2.1. Preliminary evidence for the feasibility and acceptability of a new prospective imagery attachment task. The PIAT showed good feasibility and acceptability among this sample. Participants indicated the acceptability of the task in their feedback and over 28% reported that they had found the scenarios *'easy to imagine'*. Vividness ratings were collected to capture the degree of similarity participants perceived between their mental images and real-world perceptual experiences (Baddeley & Andrade, 2000; Laing et al., 2016; Pearson et al., 2013; Stöber, 2000). Two challenges associated with assessing vividness are the risk of participant confusion regarding the concept and the dual subjective process involved in generating the image and then reporting a rating for it (Baddeley & Andrade, 2000; Neisser, 1972). When invited to feed back about the task, just six participants

reported that they had found it challenging to conceptualise or assign a numerical rating to vividness.

It was intended that the interactive, immersive nature of the virtual interaction would aid participants' ability to create the PIAT scenarios. They were able to imagine the scenes with a moderate level of vividness that was slightly higher when compared to undergraduate participants in Stöber's (2000) Prospective Imagery Task (PIT). This comparative vividness could be used to infer that the PIAT's guided imagery methodology and/or its close link to the prior experience in VR had a facilitative role for mental imagery. Indeed, relative to the PIT, the PIAT places greater demands on working memory (Baddeley & Andrade, 2000). The PIT script asks respondents to imagine generic future scenarios in a single snap-shot sentence (e.g. *'you will be able to cope easily with pressure'*). The PIAT is designed to access the ABS and, thus, describes nuanced interactional scenes. Observations in relation to the PIAT's feasibility are particularly notable because it requires participants to conduct complex manipulation of stored sensory information to generate detailed images of future interactions.

4.2.2. Attachment security is associated with imagined attachment

behaviours. The core PIAT items were designed to measure attachment security by tapping into pivotal aspects of the ABS (Crowell & Waters, 2006; Hazan & Shaver, 1994; Mikulincer & Shaver, 2016). Attachment priming research implicates a potential interaction effect between dispositional and contextually-primed attachment for the outcome of interest (Hutton et al., 2017; Gillath & Karantzas, 2018). The current correlational analyses showed no association between either self-reported trust or trust behaviour and RQ attachment security, whereas there were significant links with the PIAT items.

Attachment (in)security is predictive of interpersonal behaviour when meeting new people. Greater insecurity is related to a preference for one's own company, shyness and reduced enjoyment of socialising with new people (Allen, Fowler, & Freuh, 2013; Krieg & Dickie, 2013; Oldmeadow, Quinn, & Kowert, 2013). By contrast, in a study of young people making the transition to college (Lapsley & Edgerton, 2002), attachment security was positively correlated with social adjustment (e.g. joining new groups and making new social bonds). These findings have relevance here given that the VR paradigm involved participants meeting a stranger within one-to-one conversation. Moreover, the current PIAT data implicate consistent significant associations with attachment security and measures of imagined physical as well as emotional closeness to this new person. Perhaps then, attachment security influences behaviour when meeting new people, as well as imagined attachment behaviours when considering a future relationship with them.

4.2.3. Trust during a VR interaction is associated with imagined attachment behaviours. Given that attachment security as well as the two trust measures were significantly associated with PIAT items but not with each other, it could be that they influenced imagined attachment behaviours through different mechanisms. One potential trust-to-PIAT pathway for future investigation could be the role of paranoia. Participants with high paranoia appear uniquely susceptible to interpersonal contingency in VR; reporting greater trust in an avatar when it shows a high level of contingent behaviours (Fornells-Ambrojo et al., 2016).

It is striking that the new PIAT was significantly linked to a subjective, and especially a *behavioural* measure of trust that was independently collected during a brief virtual encounter. Although traditionally examined in the context of parent-child or romantic relationships, an attachment bond can be formed with *any* figure

who is trusted to offer comfort during times of distress (Mikulincer & Shaver, 2016). Indeed, from adolescence onwards, attachment functions are increasingly broadened out to peers, as evidenced by the way that young people begin to seek proximity to and 'safe haven' from friends (Hazan & Shaver, 1994; Nickerson & Nagle, 2005). On the one hand, it is highly unlikely that any of the sample felt an attachment bond with the avatar within a 3-minute, pleasant-but-pre-programmed interaction. Ten participants fed back that it was difficult to imagine a hypothetical future relationship based only this brief conversation. Thus, it might be argued that inferences about trust and attachment behaviours based on the PIAT must be made tentatively.

On the other hand, when extensive experience of an interactional partner is not available, people draw on heuristics to form a first impression. For instance, having mutual friends as well as similarity of appearance and behaviour shape the perceived trustworthiness of a new person (Launay, Dean, & Bailes, 2013). Thus, participants' trust in the avatar may have influenced how far they viewed the avatar as a *plausible* member of their attachment hierarchy *in future*, rather than in-the-moment. This prospective view may offer a framework for understanding the current findings: the extent to which participants reported/enacted trust in the avatar was associated with the imagined likelihood of opening up to and feeling comforted by this peer figure.

Perhaps unexpectedly, the imagined likelihood of seeking physical proximity on the PIAT was not associated with doing so in practice within the virtual interaction. We might consider the apparent mismatch according to the role of this attachment behaviour in adulthood. Adults have a wider repertoire of attachment behaviours relative to infants and, thus, do not need to rely on physical closeness to experience 'felt security' when distressed (Sroufe & Waters, 1977). For example,

adults can gain comfort merely by bringing to mind that their attachment figure can be contacted if needed (Hazan & Shaver, 1994). Perhaps then, during the PIAT, participants viewed seeking *emotional* proximity as a more appropriate strategy. This hypothesis is particularly plausible given the nature of the threat that the task introduces; disappointment and worry about one's work-related future. It also gains support from the higher average likelihood rating for emotional disclosure compared to physical proximity-seeking.

Another account for the lack of association between actual and imagined proximity-seeking could be that establishing physical closeness is an unconscious ABS process. One measure of proximity-seeking was informed by self-report (the PIAT) while the other was behavioural (interpersonal distance). Participants may have under-reported their tendency to seek and maintain proximity to a trusted figure during times of distress, relative to their actual movements in VR. By contrast, the emotional disclosure and feeling comforted PIAT items may have greater face validity as measures of attachment and, thus, elicit clearer more coherent responses.

Perhaps this distinction is evident from the inter-item correlation matrix and item-total statistics for the task. Physical proximity seeking was least correlated with total PIAT performance and removing this item would appear to increase internal reliability. However, it is important to note the Spearman-Brown prophecy formula (Nunnally & Bernstein, 1994) here: internal reliability is a function of the number of items in a scale, with a higher number of items often related to a higher α . As there was just four items on the PIAT, inferences regarding reliability must be made cautiously.

4.2.4. Absence of an association between attachment style and trust during a brief VR interaction. Attachment security was not significantly associated

with either trust outcome. These findings mark a departure from Reidy's (2016) study where there was a significant relationship with increased proximity to the flatmate in VR. By contrast, they are consistent with Fornells-Ambrojo et al.'s (2016) null findings. However, this latter existing study reported that greater subjective trust was predicted by higher levels of insecure-dismissing attachment; an effect not replicated here. Attachment security is characterised by a positive view of others and comfort with emotional closeness, whereas there is a marked preference for independence from others within insecure-dismissing attachment (Bartholomew & Horowitz, 1991). Thus, a relationship between RQ attachment styles and trust would be plausible. Why might there be no meaningful link between attachment security and trust within the virtual interaction?

There could be a methodological basis for differences between the present findings and existing studies. The current sample of both males and females was recruited from the general population. While Fornells-Ambrojo et al. assessed volunteers from the general public, they were male-only and recruited deliberately to represent a range in paranoia. Reidy studied an exclusively male sample of NHS service users with early psychosis. Previous VR research has identified that males report a greater sense of presence in virtual environments relative to females (e.g. Felhofer, Kothgassner, Beutl, Hlavacs, & Kryspin-Exner, 2012), although gender was not a basis for significant differences in either of the key trust outcomes in the current study. Variation in paranoia is related to subjective trust as well as trust behaviour in relation to an avatar character (Fornells-Ambrojo et al., 2016). Paranoid ideation was assessed in the overall assessment battery but was not analysed here because it was unrelated to the thesis research questions. There was a further, unintended difference from Fornells-Ambrojo and colleagues' research; a change in

software resulted in the avatar enacting fewer contingent behaviours. This could be important given the established link between contingency and evaluation of an interactional partner's trustworthiness (Bailenson et al., 2008). Together, these differences in the sample's gender, level of paranoia and interpersonal contingency in VR may have influenced the observed null associations between dispositional attachment and trust.

We could also make sense of the current null findings by comparing the VR paradigm against the theoretical basis for the ABS. The ABS is prioritised over other behavioural systems that focus on care-giving, sexual relationships or exploration in contexts that trigger a sense of threat. Comparison of pre- and post-VR affect scores indicates that the scenario was not distressing and may have been a mildly pleasant experience for participants. Perhaps then, level of attachment security was not a powerful source of individual difference because the sample did not perceive a threat within the virtual world.

4.3. Strengths

Strengths of the current study include its sample size, application of VR as a foundation for mental imagery, the PIAT itself and the standardised nature of the virtual interaction.

Recruiting 70 participants allowed the study 95% power to detect an association between attachment and subjective trust if it had been present in the current data, exceeding the standard 80% threshold (Cohen, 1992). The research protocol was designed to utilise the VR interaction as a dynamic, immersive stimulus (Parsons, 2015) to scaffold imagery for the PIAT scenes. As already discussed, average vividness ratings suggest that this prior experience may have enhanced the sample's ability to create even nuanced hypothetical scenes.

The PIAT itself can be viewed as a strength of this project because it offers a promising and theory-informed way to assess 'attachment-in-action', beyond a self-report questionnaire methodology. Further, this study applied a standardised virtual interaction as a valuable tool to investigate the ABS using the PIAT. Although some existing measures assess attachment to a significant other, there is a precedent for using neutral stimuli to investigate attachment orientation. Established methods have applied generic doll figures (MCAST; Futh et al., 2008) and images intentionally lacking in '*strong facial expressions and other potentially biasing details*' (AAP; George & West, 2001, p. 32). VR programming allowed us to ensure between-participant consistency in the avatar's neutrality. This allowed individual differences in trust and imagined attachment behaviours to come to the fore more clearly.

4.4. Limitations

4.4.1. Sampling. Although sample size has already been identified as a strength of the current study, there can also be risks associated with overpowered research (Case & Ambrosius, 2007). Recruiting a larger sample than necessary (i.e. to meet the accepted threshold for 80% power) could be considered an unethical use of resources, especially the time and effort of the additional participants. Further, there may have been a risk of Type I error, such that the current study identified effects as significant that were not in fact meaningful.

Participants for the current study were recruited through the UCL PALS Divisional Subject Pool and social media adverts. Using online platforms, in addition to the potential for VR to act as an incentive to volunteers, may have increased the risk of sampling bias. This risk could have been compounded by our ability to offer testing slots only on specific weekdays and within working hours. Ultimately, 34%

of the final sample were employed, whereas 57% were students. Therefore, the findings reported here may reflect a population with a greater interest in VR as well as a higher level of education and familiarity with research methods than would be expected within the target population.

In this context, it is important to note that the avatar character was a White young adult male. As detailed above, people draw upon similarity heuristics when evaluating the trustworthiness of a new person (Launay, Dean, & Bailes, 2013). Although the avatar was standardised across all participants, we did not control for this perceived avatar-participant 'match' and any associated influence it may have had on trust outcomes.

4.4.2. Application of an existing VR paradigm. Using an existing VR paradigm may have limited the extent to which the interaction with the avatar was complementary to the PIAT. First, the rich detail of the new task may be at odds with the single-item used to operationalise subjective trust in the avatar. Further, interpersonal distance in VR was interpreted as a behavioural index of trust. Although this conceptualisation is based on the precedent set by Bailenson et al. (2003), we must consider the risk that amount of movement during the scenario overall and/or interpersonal distance from the avatar in fact captured another construct, undermining the validity of the measure. These alternative constructs could include social anxiety, compliance or idiosyncratic variation in thresholds for personal space (Burgoon, Guerrero, & Floyd, 2016) and were not assessed in the current study.

Second, anticipation of a sensitive response following emotional disclosure was the only PIAT item not significantly associated with any of the outcomes (RQ attachment security, subjective trust or trust behaviour). This item may have worked

less well than the other items because the end of the VR interaction acted as an unintended attachment *insecurity* prime. The avatar breaks-off conversation to take a phone call, before requesting to reschedule the flat viewing. The PIAT guides respondents to imagine scenarios where, after opening up to the avatar, he *'doesn't look like he has paid full attention'* (insensitive response) and *'gives you his full attention, saying things that are supportive and encouraging'* (sensitive response). Some participants reported the interpretation that the avatar taking the phone call was evidence that *"he would say what he wants you to hear "* or that they had been *"dissed"*; indicating a perception of unreliability and interpersonal rejection. Comparison of descriptive statistics for the PIAT items does not indicate a reduced range, greater positive skew or a significantly lower mean on the anticipated sensitivity item across the sample as a whole. With this said, the unintended VR-PIAT sensitivity link may have had a more subtle impact not captured in the current study.

Clients in cognitive behaviour therapy for psychosis (CBTp) report experiencing paranoia about their therapist which they, in part, attribute to the generalised sense of others as untrustworthy (Lawlor, Hall, & Ellett, 2015). Indeed, ratings of perceived trustworthiness in a general population sample indicate a relationship between high paranoia and hypersensitivity for non-contingent behaviour in VR (Fornells-Ambrojo et al., 2016). Hence, individual differences such as paranoid thinking in general or about the avatar specifically were not included in the final analyses and could have masked otherwise significant associations for the PIAT imagined sensitivity item.

4.4.3. Eliciting feedback. Participant feedback on the PIAT was invited using a single, scripted prompt: *'Do you have any feedback based on your experience*

of doing the task?' It may have been beneficial to explore responses using a more rigorous approach. As the imagery task was administered at the end of the assessment battery, it was felt that it would be important to minimise participant burden and fatigue. Nevertheless, the open-ended nature of the prompt could have risked social desirability bias. Participants may have been more likely to give feedback if they felt it gave a positive, as opposed to negative, view of the study design.

4.5. Implications for future research

This paper has reported on the development of and exploratory analyses in relation to a new attachment-focused prospective mental imagery task. Future research could be designed specifically to investigate the psychometric properties of the PIAT with a larger and more representative general population sample. Such a study could analyse concurrent validity beyond the RQ alone. The PIAT could be compared against additional established measures such as the AAP (George & West, 2001). Futh and colleagues (2008) investigated the association between MCAST attachment narratives and children's behavioural problems, emotional problems and social competence. Thus, a comprehensive PIAT validation study could assess its concurrent as well as predictive validity in relation to theoretically-relevant outcomes (Barker & Pistrang, 2015). This would be a valuable focus given the established relationship between degree of attachment (in)security and outcomes such as social functioning (e.g. Groh et al. 2014) and adult psychopathology (e.g. Dozier & Stovall-McClough, & Albus, 2008).

As a further phase in exploring potential applications of this novel measure, it would be of interest to investigate how it performs when the target attachment figure

is *known* to respondents. This would offer an informative point of comparison with the current findings because responses were elicited by hypothetically extending a one-off virtual meeting with a stranger. Existing attachment measures have been used to assess representations of self and other within close relationships (Baldwin et al., 1993; Brennan, Clark, & Shaver, 1998; Rempel, Holmes, & Zanna, 1985). We might expect that respondents' familiarity with the focal person would affect the vividness of mental imagery during the task as well as perceived likelihood ratings, according to lived experience of the bond.

The current study also has broader methodological implications for mental imagery research. Here, quality of mental images was assessed using scales to represent vividness and likelihood (Laing et al., 2016; MacLeod et al., 1996; Stöber, 2000). However, developing the PIAT shed light on the considerable range in variables used to operationalise imagery within the field. Speed of generation, number of images, level of detail, sense of 'now-ness', duration, emotional content, extent of distortion and clarity are all alternative/supplementary measures included in imagery studies to-date (Lockett, Hatton, Turner, Stubbins, Hodgekins, & Fowler, 2012; MacLeod et al., 1996; Patel, Brewin, Wheatley, Wells, Fisher, & Myers, 2007; Stöber, 2000). These also vary according to whether they assess spontaneously occurring mental images or those created deliberately, as well as whether participants are asked to imagine scenes through a field or observer perspective. It is unclear whether these variables tap into overlapping constructs or make a unique contribution to investigation of mental imagery. Such methodological diversity could risk undermining our ability to compare and synthesise findings across mental imagery research.

4.6. Implications for clinical practice

These exploratory results point to a link between attachment security, subjective trust and trust behaviour during a one-off virtual meeting and the imagined likelihood of moment-to-moment attachment behaviours. These findings could have relevance for the therapeutic alliance in clinical context.

Experimental research indicates that people are more willing to take risks in an economic game if they perceive the outcome to be dictated by chance rather than the trustworthiness of another player; the latter condition poses the unique risk of incurring '*betrayal costs*', beyond monetary loss (Bohnet & Zeckhauser, 2003). The ABS may offer a framework for understanding individual differences in such prospective evaluation of trustworthiness. Those who are high in attachment security seek comfort from others to regulate negative affect (Mikukliner & Shaver, 2016). By contrast, an insecure attachment orientation can result in hypersensitivity to the risk of interpersonal rejection or avoidance of emotional expression during times of threat (Carnelley et al., 2015).

It would be valuable to conduct research to investigate whether the significant associations identified for the PIAT task here are present within a clinical sample. If so, perhaps the proximity-seeking domain could have relevance for clients' willingness to attend therapy sessions when distressed. Equally, the findings for emotional disclosure and anticipated comfort may relate to clients' ability to engage in open, honest dialogue with their therapist. This is especially pertinent given evidence for a positive association between quality of the therapist-client bond and treatment outcome (Flückiger, Del Re, Wampold, Symonds, & Horvath, 2012; Horvath and Symonds, 1991; Martin, Garske, & Davis, 2000).

Existing research that examines therapy engagement in psychosis illustrates this potential clinical significance of the current findings. Prevalence of attachment insecurity is higher in people with psychosis relative to a non-clinical population (Carr, Hardy, & Fornells-Ambrojo, 2017). However, positive expectations of therapy and positive evaluation of therapist trustworthiness are significantly correlated with service user progress during CBTp (Lawlor, Sharma, Khondoker, Peters, Kuipers & Johns, 2017). Therefore, if replicated in a clinical sample, the present findings related to attachment, trust and future attachment behaviours would further indicate the central importance of emphasising engagement in therapy from the earliest interactions (Rollinson et al., 2008). This may be especially important if clients low in attachment security are to gain optimal benefit from therapy.

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Part 3: Critical Appraisal

1. Introduction

This critical appraisal formalises the reflective log I kept throughout the thesis. Thus, it considers themes that span the research timeline; from initial project-planning to lessons learned that could inform future studies in the field. Although these points have relevance for the literature review and empirical paper, there will be a particular focus on the latter. I will reflect on: challenges of recruiting a clinical sample, debate surrounding meaningful service user involvement in research and factors to consider when using virtual environments to investigate social interactions.

2. Clinical Recruitment Challenges: Learning from Experience

2.1. Laying the groundwork

As I embarked on planning the empirical paper, I hoped to draw on my pre-training role as a Research Assistant working on virtual reality (VR) research, as well as insights offered by previous UCL trainees.

Before starting the D.Clin.Psy., I gained my first experience of working with service users affected by psychosis as part of a research team that aimed to develop new cognitive behaviour therapy (CBT) based treatments for persecutory delusions. I observed first-hand how recruiting this population allowed a study's clinical implications to be informed directly by client perspectives. This experience made me hopeful that I would be able to conduct my thesis research with a clinical sample. It also left me mindful of the challenges associated with recruiting this hard-to-reach group (Freeman et al., 2016).

In addition, it was crucial to incorporate lessons learned by former UCL trainees into the preparatory phase of the thesis. Gail Wingham and Hannah Reidy (Doctoral theses, 2016) had used the research protocol that Hayley and I planned to

adapt for our own projects, including recruitment of NHS service users with psychosis. They shared how the lengthy process of applying for ethical approval was often frustrating and had meant that they completed their study with significantly fewer participants than planned. They also conveyed that once ethical approval had been granted, a persistent approach to communicating with NHS teams had been essential to their recruitment phase. I found their honesty about the challenging aspects of the thesis to be an invaluable resource when evaluating my progress, especially as projects within the same cohort of the D.Clin.Psy. can follow such diverse timelines.

2.2. Clinical recruitment in practice

On reflection, it is striking that Hayley and I managed to pre-empt the first of these obstacles (a lengthy wait before being granted ethical approval) but still grappled with the second (recruitment within NHS teams). We successfully obtained a substantial amendment to the existing ethical approval granted by the Research Ethics Committee (REC). This process involved delineating carefully the measures that we would be adding/removing, as well as the revised end-date for the study. We submitted our documentation in April 2017 and were notified of the REC's favourable opinion by early May. Hence, we were able to circumvent the 15-month delay that our predecessors experienced before they could begin recruitment.

By contrast, recruiting our sample through NHS Early Intervention in Psychosis (EIP) teams proved to be highly problematic. We were able to establish regular communication with just three of the nine teams within the NHS trusts covered by our ethical approval. This was despite repeated efforts at contact and our suggestion that we visit their offices in-person. After 5 months, we had been able to

attend just one team meeting to present our research and had received only a single referral to the study.

Such a disappointing outcome could be related to the competing pressures that EIP services are faced with at present. Research teams from the London universities contact these services regularly and, naturally, such requests are secondary to their clinical demands. In recent years, NHS England (2016) has introduced a new standard for EIP teams; requiring that more than 50% of people experiencing first episode psychosis be started on a National Institute for Health and Care Excellence-recommended package of care within 2 weeks of referral. This target to reduce waiting times and enhance service accessibility has elevated the pressure for efficiency within EIP teams.

In this context, the request for teams to hold our study in mind, as well as find time to discuss it with eligible clients and gain their consent to be contacted, may have seemed impractical. Such factors were compounded by the competing pressures on time-management that we experienced as trainees. In contrast to my former role as a Research Assistant, I was attending placement throughout the recruitment process and was consequently unable to dedicate my full working week to pursuing referrals. Therefore, systemic within-service factors alongside the challenge of combining proactive communication with teams and other course commitments, may aid understanding of our recruitment struggles.

2.3. Deciding to change tack: From a clinical to a general population sample

Through discussion as a research team in October 2017, we decided to revise our target sample from service users with psychosis to the general population. We

submitted an amended application to the UCL REC and heard confirmation of our ethical approval by mid-December.

2.3.1. The pros: An achievable timeline, sample size and transferability of service user feedback. This decision to change tack demanded that we weigh our hope of recruiting a clinical sample and time we had already put into contacting NHS teams against a pragmatic view of our thesis timeline. Our target was to complete all data collection by the end of March 2018 to leave time for the analysis and write-up phases of the project. Although we had anticipated a gradual start to recruitment, we had been optimistic that we would build a relationship with clinical teams and, thus, receive an increasing number of referrals over time. As this expectation had not been met with 6 months left until our March cut-off, we prioritised the opportunity to conduct the strongest possible investigation of our research questions within a general population sample. Ultimately, we recruited and tested 70 participants over 3 months and with limited difficulty. Indeed, this sample size exceeded the necessary number derived from my power calculation. A secondary benefit was that I was able to explore my new prospective imagery attachment task (the PIAT) among a substantial group of participants from the general public, rather than examining it within a smaller clinical sample straight away.

We consulted a member of the UCL Service User Panel at the outset of the project to trial our research protocol. Although this decision was informed by our plan to recruit a clinical sample, his recommendations helped us to understand the potential emotional impact of our measures for *anyone* who might take part. Based on his feedback, we developed a procedure for how we would introduce each measure to establish a sensitive, 'human' atmosphere for our participants throughout data collection.

We also used this feedback to design a debrief information sheet for all participants after they completed the study. It acknowledged that the questionnaires were of a personal nature and sign-posted them to appropriate sources of support if they had experienced distress while taking part but did not feel able to voice this to either a researcher or members of their social network. We implemented these refinements in the final protocol and received highly positive informal responses from participants about their experience of taking part. This process illustrated for me how consulting service user expertise when planning a study can enrich the whole process, instilling an emphasis on conducting more just and ethical research (Callard & Rose, 2012).

2.3.2. The cons: Limited service user involvement and reduced confidence in clinical implications. Nevertheless, the decision to stop pursuing NHS recruitment came with a degree of disappointment. The World Health Organisation in Europe (2009) has outlined the importance of involving clinical samples in research so that service planning and policy come to reflect the diversity of the general population. This principle highlights two considerable drawbacks to the current thesis given the limited involvement of a service user perspective.

While we sought service user feedback early on, it could be argued that this approach marks a 'consumerist' rather than 'democratic' stance (Beresford, 2002). By asking for this representative's feedback on the assessment battery we had prepared, we may have positioned a service user viewpoint as outside the central processes of the study. Indeed, our ultimate recruitment decision may underscore the barriers that people affected by mental health difficulties can face before being able to participate in, let alone *collaborate* on research. There is a risk that our move away from recruiting NHS clients is indicative of the '*inappropriately invisible*' (Smith, 2008, p.

250) nature of marginalised groups in academic studies that relate to their care. In the Discussion sections of my empirical paper and systematic review, I have ventured clinical implications of my findings. It would have been far preferable if these conclusions had been grounded in direct insights from service user participants.

2.4. Lessons for future D.Clin.Psy. thesis recruitment

In light of the invaluable guidance I received from my predecessors in the research group, I have considered how my learning-through-experience could be taken forward. How could it be made more feasible to recruit service users with psychosis into VR research within the scope of a D.Clin.Psy. thesis?

Having a member of the research group embedded within at least one of the NHS clinical teams could have a two-fold benefit. First, this representative would be able to bring the project to the team's attention on a regular basis and clarify any questions about the research aims or eligibility criteria. Second, they could streamline recruitment by acting as a trusted, single point of access for referrals. Such an in-person process may offer greater efficiency than follow-up communication from relative strangers outside the team. An additional suggestion could be to invite representatives from the NHS teams to visit the UCL Computer Aided Virtual Environment and try the VR paradigm for themselves. This experiential opportunity could leave clinical team members feeling more confident to describe the study to clients. It could also be viewed as a 'thank you' or acknowledgement of their pivotal support for the recruitment process.

3. Reduced Interpersonal Contingency in Virtual Reality: Considering the Impact on the Present Study

The central focus for the current empirical paper was investigating participant responses to the PIAT and its associations to attachment security, subjective trust and trust behaviour in VR. Therefore, the role of interpersonal contingency during the virtual interaction was not examined in these exploratory analyses. However, it is valuable to consider its potential influence here, with a view to interpreting the present findings and planning future research.

An aspect of the avatar flatmate's contingent responding that had been present for participants in Fornells-Ambrojo et al.'s (2016) study was absent during current data collection. Why are these nuanced avatar responses important in research that uses VR scenarios to investigate social interactions? First, contingent responses are likely to contribute to sense of presence (Slater et al., 1998). The degree to which participants felt immersed in the virtual flat-share environment may have been undermined by reduction in the avatar's life-like movements.

Second, reduced interpersonal contingency may have had an influence on the key outcome measures of subjective trust and trusting behaviour. Bailenson et al. (Bailenson, Yee, Patel, & Beall, 2008) have highlighted the shared human tendency to be a 'chameleon' in social contexts. At an implicit level, we converge with an interactional partner through our verbal and non-verbal behaviours. Where we do not have long-term experience of another person, we rely on other factors to make inferences about their trustworthiness (Launay, Dean, & Bailes, 2013). Launay and colleagues highlight that these alternative cues include the number of shared social contacts, how similar their appearance is to our own and the degree of synchronised movement we share. Maddux et al. (Maddux, Mullen, & Galinsky, 2008) observed

that mimicry predicted the likelihood of participant pairs agreeing on a deal during a mock negotiation paradigm. Further, this study established a crucial role for trust. A mutual perception of trustworthiness mediated the effect of implicit mimicry on likelihood of deal-agreement.

With this said, self-reported trust in the avatar flatmate during the current study was only slightly lower than the sample average reported by Fornells-Ambrojo et al. (4.61 vs. 4.87: 1-7 scale). Interpersonal distance from the avatar (conceptualised as an objective measure of trust) was identical across the two studies (1.43m). Thus, we can infer that the small set of contingent avatar movements that were lost in the current research did not have a meaningful detrimental impact on trust when 'meeting' a new person.

Nevertheless, the above mimicry literature in addition to the current finding of associations between trust and imagined attachment behaviours, highlight that the relationship between interpersonal contingency and responses on the new PIAT may warrant further investigation. In particular, future research could explore whether randomisation to a high or low contingency condition during a one-off virtual encounter with the avatar exerts an influence on imagined attachment behaviours towards this interactional partner.

4. Virtual Reality: Sense of Presence in Contemporary Samples

Anecdotal feedback at the end of each participant's testing slot highlighted that the VR aspect of the study was a strong incentive for participation. This appears to have facilitated an efficient recruitment process, but does lead me to reflect on the potential for sampling bias and a mismatch between my research questions and participant motivations for volunteering.

Seventy per cent of the sample had previous experience of VR technology and 20% did not pass one or more of the VR attention check questions. These observations could indicate that some prioritised testing out the limits of the virtual world over engaging with the avatar specifically. For example, when invited to share feedback about the study, one participant said: "*in the VR, I was trying to listen to Mark, whilst also exploring the environment*". Responses on the Sense of Presence questionnaire (Slater et al., 1998) suggest that many participants experienced this tension. On average, the sample reported that they did not feel '*overwhelmed*' by the perception that they were in the virtual flat, relative to '*standing in a room wearing equipment*' throughout the scenario (1-7 scale: $M = 3.97$, $SD = 1.56$). This split-focus during the VR paradigm may have undermined their ability to interact with the avatar and, thus, the validity of my inferences about the relationship between responses in the virtual world and interpersonal trust as well as imagined attachment behaviours.

It is relevant here to consider Zyda's (2005) concept of 'digital game natives'; those who have grown up with exposure to video games and related technology. Some games, such as the multiplayer online role-playing format, can involve richly detailed environments and avatars (Bailenson, Beall, Loomis, Blascovich, & Turk, 2005). Given that the average age of participants was 26 years old, it is plausible that a subset of the sample were such digital game natives. They may have been interested in drawing technical-level comparisons between the flat-share scenario and their prior experience of VR and/or sophisticated gaming technology. If applicable for much of the sample, this motivation for taking part and approach to the VR interaction would undermine the ability to consider our current findings representative of the general population.

Nevertheless, our sample reported that the *dominant* experience was more consistent with being in a virtual flat rather than a laboratory ($M = 4.94$, $SD = 1.48$). Further, and despite the passage of time, the average overall sense of presence score in our sample ($M = 26.09$, $SD = 6.73$, $Range = 7-40$) was marginally higher than those documented in existing VR research within a general population sample (Fornells-Ambrojo et al., 2016 [same flat-share scenario]; Fornells-Ambrojo et al. 2008 [London tube train scenario]). These observations are consistent with the literature: despite participants' awareness that they are in a virtual environment and with non-human characters, they respond as if the interactions were real (e.g. Freeman et al., 2016; Klinger et al., 2005), for example ascribing mental states to computer-generated characters (Freeman et al., 2003). With these considerations in mind and as the accessibility of VR technology grows, it can be ventured that future researchers using virtual environments should be mindful of which environment (virtual vs. physical) dominates for participants (Slater et al., 1998) and why.

5. Conclusions

This critical appraisal has tracked reflections that were stimulated throughout the thesis process. I first outlined the consideration that went into planning ahead for the ethics application and recruitment processes. Although this preparation was valuable in shaping more realistic expectations, the decision about whether to move away from studying a clinical sample was not one I expected our research group to be faced with. Therefore, the second focus was weighing up the efficiency and predictability of recruiting general population participants against a reduced ability to make inferences about clinical applications of the findings. Third, the appraisal explored the potential but ultimately minimal consequences of an error that led to reduced interpersonal contingency during our version of the VR scenario. Fourth,

and with a view to future research, I considered the extent to which everyday exposure to advancing technology may influence responses to virtual environments in a research context.

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Appendices

Appendix 1: Database-specific search term formatting

PubMed

((((psychos?s) OR (psychotic*) OR (schizo*) OR (paranoi*) OR (hallucinat*) OR (delusion*)))

AND

((alliance) OR (“therap* relationship”) OR (“therap* bond”)))

AND

((therap*) OR (intervention) OR (psychotherap*) OR (CBT) OR (mindfulness)))

Extra filters used:

- Start of database up to 31st July 2017
- Type of publication- journal article, clinical trial, randomised controlled trial, pragmatic clinical trial, clinical study, journal article, controlled clinical trial, systematic review, meta-analysis
- Humans
- English language

PsycInfo/ProQuest and EMBASE

(psychos?s OR psychotic* OR schizo* OR paranoi* OR delusion* OR hallucinat*)

AND

(alliance OR therap* relationship OR therap* bond)

AND

(therap* OR intervention OR psychotherap* OR CBT OR mindfulness)

Extra filters used for PsychInfo:

- Humans
- English language
- Peer-reviewed journals
- Publication type- journal article

Extra filters for EMBASE:

- Human
- English language
- Source type- Journal
- Publication type- article, article in press, conference paper

**Appendix 2: Adapted NIH Quality Assessment Tool for Before-After (Pre-Post)
Studies with No Control Group**

Quality Assessment Criteria		Rating			
		0	1	2	Other*
<i>Research Question</i>					
1.	Was the study question/objective clearly stated?				
2.	Was the study designed to assess the relationship between therapeutic alliance and outcome specifically?				
<i>Sample</i>					
3.	Were eligibility/selection criteria for the study population pre-specified and clearly described?				
4.	Were the participants in the study representative of those who would be eligible for the test/service/intervention in the general or clinical population of interest? <i>AND</i> Were all participants who met the prespecified entry criteria enrolled?				
5.	Was the sample size sufficiently large to provide confidence in the findings? <i>AND</i> Was a sample size calculation reported?				
6.	Was the loss to follow-up after baseline 20% or less?				
<i>Intervention</i>					
7.	Was the test/service/intervention clearly described and delivered consistently across the study population?				
8.	Was the test/service/intervention delivered as described and with consistency across the study population?				
<i>Quality of Measures</i>					
9.	Were the people assessing the outcomes blinded to the participants' exposures/interventions?				
10.	Were the measures prespecified, clearly defined, valid, reliable and assessed consistently across all study participants? • Therapeutic alliance • Treatment outcome				
<i>Statistical Analyses & Reporting</i>					
11.	Did the statistical methods examine changes in outcome measures from before to after the intervention? <i>AND</i> Were those lost to follow-up accounted for in the analysis?				
12.	Did reporting of the statistical tests provide p values for the pre- to-post changes? <i>AND</i> Were the findings reported clearly, regardless of whether they were significant or non-significant?				

Note. * 'Other' = Could not determine (CD), not applicable (N/A) or not reported (NR).

Rows highlighted in grey represent the items that were added in/significantly adapted for the current review.

**Appendix 3: Individual item quality ratings for included psychological
intervention papers**

Author (Year)	Research Question		Sample			Intervention					Quality of Measures								Statistics		
	Clarity	TA-Outcome relationship central to research questions?	Eligibility Criteria	Sample Characteristics	Sample Size	Attrition	Description of Intervention	Intervention Fidelity	Blinding	Measure: Therapeutic Alliance (TA)	Psychiatric Symptoms	Psychotic Symptoms	Functioning	Quality of Life	Substance Use	Hospitalisation	Therapy Engagement	Self-Esteem	Hopefulness	Statistical Methods	Statistical Reporting
Andrews et al. (2016)	2	N	2	2	CD	1	2	1	2	2	2	-	2	-	-	-	-	-	-	1	1
Berry et al. (2015)	1	N	2	1	CD	2	2	2	2	2	-	0	2	-	2	-	-	-	-	1	1
Berry et al. (2016)	1	N	2	1	CD	1	2	2	2	2	2	2	2	-	2	-	-	-	-	2	1
Davis & Lysaker (2007)	2	N	2	1	CD	0	1	0	2	2	-	2	-	-	-	-	-	-	-	2	0
Dunn et al. (2006)	2	N	2	2	CD	0	2	1	0	2	-	2	-	-	-	-	-	-	-	2	1
Frank & Gunderson (1990)	1	N	2	1	CD	1	2	0	2	2	2	1	1	-	-	2	2	-	-	2	1
Goldsmith et al. (2015)	2	N	2	1	CD	2	2	2	2	2	-	2	-	-	-	-	-	-	-	2	2
Huddy et al. (2012)	2	Y	2	1	0	1	2	1	0	2	1	-	2	-	-	-	-	2	-	2	2
Johnson et al. (2008)	2	N	2	1	CD	2	2	2	2	1	2	2	2	-	-	2	-	-	-	1	2
Lecomte et al. (2012)	2	N	2	1	CD	1	2	2	2	2	2	2	2	2	-	-	0	2	-	2	1
Lecomte et al. (2015)	2	Y	2	1	0	1	2	0	0	2 ⁺	0	2	2	-	-	-	-	2	-	2	1
Mulligan et al. (2014)	2	N	2	2	CD	1	1	0	0	2	0	2	2	-	-	-	-	-	-	1	2

Author (Year)	Research Question		Sample			Intervention					Quality of Measures								Statistics		
											Psychiatric Symptoms	Psychotic Symptoms	Functioning	Quality of Life	Substance Use	Hospitalisation	Therapy Engagement	Self-Esteem	Hopefulness	Statistical Methods	Statistical Reporting
Staring, Gaag, & Mulder (2011)	1	N	2	2	CD	2	2	0	0	2	2	2	-	-	-	-	-	-	-	1	2
Startup et al. (2006)	2	N	1	1	CD	1	2	2	2	2 ⁺	2	1	-	-	-	-	-	-	-	2	2

Note. Papers in grey = papers included in meta-analyses. '-' = outcome measure not assessed in a given paper. In accordance with the NIH assessment tool, 'CD' = could not determine; applied for studies that were not designed specifically to test the associations between alliance and outcome and thus, may be under-powered to investigate the TA-outcome association of interest.

⁺ Alliance section divided into two because two measures were used: Lecomte et al. (2015) = WAI-Short form and the QuickLL; Startup et al. (2006) = the Active Engagement Scale and the WAI-Observer form. In the 'TA-outcome relationship central to research questions?' column, 'Y' = Yes and 'N' = TA-outcome relationship reported as part of secondary data analysis, not central to research questions in original paper.

**Appendix 4: Individual item quality ratings for included routine care
intervention papers**

Research Question	Sample		Intervention			Quality of Measures										Statistics				
	Clarity	TA-Outcome relationship central to research questions?	Eligibility Criteria	Sample Characteristics	Sample Size	Attrition	Description of Intervention	Intervention Fidelity	Blinding	Measure: Therapeutic Alliance (TA)	Psychiatric Symptoms	Psychotic Symptoms	Functioning	Quality of Life	Hospitalisation	Therapy Engagement	Self-Esteem	Hopefulness	Statistical Methods	Statistical Reporting
Berry & Greenwood (2015)	1	Y	2	1	1	NR	2	N/A	0	1 ⁺	1	-	2	1	-	-	-	2	1	2
Catty et al. (2010)	1	N	2	2	CD	1	1	N/A	0	2	2	2	2	2	-	2	-	1	2	
Cavelti, Homan, & Vauth (2016)	2	N	2	2	CD	0	0	N/A	0	2	2	2	-	-	-	-	-	2	2	
Farrelly et al. (2014)	2	N	2	1	CD	2	2	N/A	2	2	-	-	2	-	2	2	-	-	2	2
Kayton, Beck, & Soon (1976)	1	Y	0	1	0	NR	0	N/A	0	0	1	0	1	-	1	-	-	1	1	
Novick et al. (2015)	2	N	2	2	2	2	0	N/A	0	2	2	2	2	-	-	-	-	-	2	1
Olfson et al. (1999)	1	Y	2	1	CD	2	0	N/A	0	2	-	-	-	-	1	-	-	-	1	2
Reininghaus et al., (2013)	2	N	2	2	CD	0	1	N/A	0*	1	2	-	-	-	2	-	-	-	2	2
Tattan & Tarrier (2000)	1	N	2	1	CD	NR	1	N/A	1	1	2	2	2	2	2	-	-	-	2	2

Note. '-' = outcome measure not assessed in a given paper. In accordance with the NIH assessment tool, 'NR' = not reported and 'CD' = could not determine; latter applied for studies that were not designed specifically to test the associations between alliance and outcome and thus, may be under-powered to investigate the TA-outcome association of interest.

In the 'TA-outcome relationship central to research questions?' column, 'Y' = Yes and 'N' = TA-outcome relationship reported as part of secondary data analysis, not central to research questions in original paper.

*Blinding section divided into two because Reininghaus et al. (2013) collated data from two trials; the first reported no blinding procedure, the second did blind assessors to intervention condition but they were unblinded for over half of participants.

*Alliance section divided into two because two measures were used: Berry & Greenwood (2015) = composite score derived from client-rated WAI-s and the Perceived Expressed Emotion in Staff Scale and composite score derived from therapist-rated WAI-s and Adjective Checklist.

Appendix 5: Trialling meta-analyses for the association between therapeutic alliance and change in psychotic symptoms using three different strategies for Lecomte et al.'s (2015) outcome data

Data Analyses Strategy	k	n	Mean Effect Size (r)	95% CI	Z (p)	Q (p)	I²
<i>Client-Rated Therapeutic Alliance</i>							
Trial 1: Including change in PSYRATS Delusions outcome only	4	229	0.17	0.04-0.31	2.56 (.011)	0.41 (.94)	0%
Trial 2: Including change in PSYRATS Hallucinations outcome only	4	226	0.17	0.04-0.31	2.53 (.011)	0.47 (.93)	0%
Trial 3: Excluding the paper	3	218	0.18	0.04-0.31	2.55 (.011)	0.36 (.83)	0%
<i>Therapist-Rated Therapeutic Alliance</i>							
Trial 1: Including change in PSYRATS Delusions outcome only	3	247	0.30	0.17-0.43	4.62 (<.0001)	0.28 (.87)	0%
Trial 2: Including change in PSYRATS Hallucinations outcome only	3	243	0.31	0.19-0.44	4.80 (<.0001)	0.28 (.84)	0%

Note. Trials highlighted in grey denote the approach taken forward into the final meta-analyses for the change in psychotic symptomatology outcome measure.

Appendix 6: Summary of joint project and each researcher's contribution

This project used a virtual reality (VR) paradigm to investigate subjective and behavioural trust processes. The VR scenario was originally used in a University College London (UCL) Clinical Psychology Doctoral Thesis by Dr. Maaïke Elenbaas (submitted in 2013 and published in 2016 by Fornells-Ambrojo et al., 2016). It has also been used in both Dr. Gail Wingham and Dr. Hannah Reidy's UCL Clinical Psychology Doctoral Thesis projects (GW and HR completed recruitment and data collection jointly; both submitted their independent thesis projects in 2016). The current study was completed by Emilie Bourke (the author) and Hayley Dolan (fellow UCL D.Clin.Psy. Trainee and joint project researcher). Both were supervised by Dr. Miriam Fornells-Ambrojo and Professor Chris Barker.

The current author's thesis used the VR paradigm to explore the extent to which dispositional attachment and imagined attachment behaviours are associated with subjective trust and trust behaviour in an interactional context. Imagined attachment behaviours were explored using a new prospective imagery attachment task (the PIAT). HD's thesis focused on the association between childhood trauma, negative schemas and trust.

The research measurement choices within the present thesis were made with HD under the supervision of Dr. Fornells-Ambrojo and Professor Barker. These decisions were made jointly with HD to ensure that the proposed recruitment and data collection processes were feasible, efficient and allowed each of the researchers to investigate their chosen research questions. A series of the research measures were shared across EB and HD's projects: the subjective trust scale (single-item rating scale), objective trust (average distance maintained from the avatar during the final stage of the interaction in VR), the Sense of Presence Questionnaire (Slater, Steed, McCarthy, & Maringelli, 1998), the Positive and Negative Affect Schedule

(PANAS; Watson, Clark & Tellegen, 1988), the questions about previous experience of VR and flat-sharing, the post-VR attention checks and the post-VR contingency checks (Elenbaas, 2013; Fornells-Ambrojo et al., 2016). The Relationship Questionnaire (Bartholomew & Horowitz, 1991) and the novel PIAT were unique to the current empirical paper.

Ethical approval was sought jointly for the two thesis projects by both researchers and research governance processes were completed together. Both researchers were involved in the recruitment of participants. Testing participants at the UCL CAVE as well as data entry was divided equally between EB and HD. Data analysis and write-up of the present thesis was conducted entirely by Emilie Bourke under the supervision of Dr. Fornells-Ambrojo and Professor Barker.

References:

- 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), 226-244.
- Elenbaas, M. (2013). Paranoia and the Role of Contingency in the Experience of Trust and Perceived Empathy in Interpersonal Encounters (Doctoral thesis, University College London).
- 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.
- Reidy, H. (2016). No man is an island: Exploring the links between social

connectedness and trust in clinical paranoia using a virtual reality paradigm (Doctoral thesis, University College London).

Slater, M., Steed, A., McCarthy, J., Maringelli, F. (1998). The influence of body movement on subjective presence in virtual environments. *Human Factors*, 40(3), 469-477.

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), 1063-1070.

Wingham, G. (2016). The role of interpersonal contingency and self-focused attention in the development of trust in clinical paranoia: A virtual reality study (Doctoral thesis, University College London).

Appendix 7: Notice of ethical approval letter



30 November 2017

Dr Miriam Fornells-Ambrojo
Research Department of Clinical, Educational and Health Psychology
UCL

Dear Dr Fornells-Ambrojo

Notification of Ethics Approval with Provisos

Project ID/Title: 12179/001: Using virtual reality to investigate psychological factors in paranoia

I am pleased to confirm in my capacity as Co-Chair of the UCL Research Ethics Committee (REC) that the data collection element of your study has been ethically approved by the UCL REC until 1st December 2018 subject to the following proviso:

1. Please confirm whether you have been granted 'conditional' data protection registration approval. Given that you are collecting personal data and data collection extends beyond the data when the new General Data Protection Regulation (GDPR) comes into force i.e. May 2018 your participant documentation is not GDPR compliant and it is highly likely that the documents will need to be updated. See attached an annotated template GDPR compliant participant information sheet (containing a mandatory privacy notice) and consent form, which you should use as a guide to make your documentation GDPR compliant

Ethical approval is also subject to the following conditions.

Notification of Amendments to the Research

You must seek Chair's approval for proposed amendments (to include extensions to the duration of the project) to the research for which this approval has been given. Ethical approval is specific to this project and must not be treated as applicable to research of a similar nature. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing an 'Amendment Approval Request Form' <http://ethics.grad.ucl.ac.uk/responsibilities.php>

Adverse Event Reporting – Serious and Non-Serious

It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator (ethics@ucl.ac.uk) immediately the incident occurs. Where the adverse incident is unexpected and serious, the Joint Chairs will decide whether the study should be terminated pending the opinion of an independent expert. For non-serious adverse events the Joint Chairs of the Ethics Committee should again be notified via the Ethics Committee Administrator within ten days of the incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Joint Chairs will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

Final Report

At the end of the data collection element of your research we ask that you submit a very brief report (1-2 paragraphs will suffice) which includes in particular issues relating to the ethical implications of the research i.e. issues obtaining consent, participants withdrawing from the research, confidentiality, protection of participants from physical and mental harm etc.

In addition, please:

- ensure that you follow all relevant guidance as laid out in UCL's Code of Conduct for Research: <http://www.ucl.ac.uk/srs/governance-and-committees/resgov/code-of-conduct-research>
- note that you are required to adhere to all research data/records management and storage procedures agreed as part of your application. This will be expected even after completion of the study.

With best wishes for the research.

Yours sincerely



Dr Lynn Ang
Joint Chair, UCL Research Ethics Committee

Encs.

Cc: Hayley Dolan & Emilie Bourke

Appendix 8: Participant information sheet

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: UNDERSTANDING SOCIAL INTERACTIONS USING VIRTUAL REALITY

We would like to invite you to take part in a study looking at people's social interactions within virtual environments. This project is part of a doctoral research project. 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.

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 from the general population, who are 18 years old or above. In total, we hope that 30 volunteers will take part.

Do I have to take part?

It is up to you to decide whether or not to take part. Choosing not to take part will not disadvantage you in any way. If you do decide to take part you will be given this information sheet to keep, and be asked to sign a consent form. You are still free to withdraw at any time, without giving a reason.

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 lab at University College London for a one-off visit. We expect that this session will take approximately one hour and you will be reimbursed for your time. 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 questionnaires, we will invite you to enter the virtual reality lab, which represents a 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 flat for a brief time and interact with a virtual flatmate character. The whole scenario will last 3 minutes. During your time in the virtual environment your movement will be tracked by motion sensors. There will be another researcher directly outside the virtual reality lab at all times to ensure that you feel comfortable during the exercise.

Part 3 – Questionnaires: Following the virtual reality exercise, we will ask you to complete some final questionnaires about your feelings at that time.

Part 4 – Interview: A researcher will complete a brief interview with you that asks about your experience of interacting with the virtual flatmate.

Will I be paid for my participation?

You will be paid £12.50 to thank you for your time.

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 personally, 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 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 Hayley Dolan or Emilie Bourke 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 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 UCL Research Ethics Committee.

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

Research Team Members:

Hayley Dolan, Trainee Clinical Psychologist, Department of Clinical, Educational and Health Psychology, University College London. Telephone: Email: hayley.dolan.13@ucl.ac.uk

Emilie Bourke, Trainee Clinical Psychologist, Department of Clinical, Educational and Health Psychology, University College London. Telephone: Email: emilie.bourke.15@ucl.ac.uk

Dr. Miriam Fornells-Ambrojo, Lecturer in Clinical Psychology, Department of Clinical, Educational and Health Psychology, University College London. Email: Miriam.fornells-ambrojo@ucl.ac.uk

Appendix 9: Post-participation support sign-posting sheet

We realise that the questionnaires you have just completed relate to personal and, at times, sensitive topics. Below is some information about sources of support you can access should you feel that you this would be helpful:

Samaritans

<https://www.samaritans.org>

*Whatever you're going through, call us free any time, from any phone on **116 123**. We're here round the clock, 24 hours a day, 365 days a year. If you need a response immediately, it's best to call us on the phone. This number is FREE to call. You don't have to be suicidal to call us.*

Mind

<https://www.mind.org.uk/information-support/helplines/>

Mind Infoline: 0300 123 3393 or Text: 86463

Our team provides information on a range of topics including:

- *types of mental health problems*
- *where to get help*
- *medication and alternative treatments*
- *advocacy*

We will look for details of help and support in your own area.



Your GP

If you would like to talk to someone in-person in a confidential environment, we would encourage you to arrange an appointment with your GP. They will also be able to signpost you to any local sources of support that may be relevant to you.

Appendix 10: Full script of the conversation between participant and avatar

Participant	Mark
<i>Greetings</i>	
<i>[Tells avatar their name]</i>	Hi my name is Mark thanks for coming. What's your name?" Thanks, OK I'm ready
<i>Questions about flat-sharing</i>	
1. What do you like about flat-sharing?	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
2. How do you choose flatmates?	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 or their girlfriends around ... Oh, yeah it is also good to ask them what has been their best and worse experience of flat sharing
3. What makes a good flatmate?	Mhm... good question... don't know... I'm trying to thinksomeone 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
4. What is the best thing about this flat?	The terrace, and the view! . . .
<i>Avatar invites participant to view the terrace</i>	

Participant	Mark
	<p>. . . come and have a look!</p> <p><i>[Avatar moves to window and gazes outside before turning back to face participant]</i></p> <p>It's amazing to have all this outside space, in the summer we practically live out here! We have great barbecues and parties and -</p>
	<p><i>Avatar receives unexpected phone call</i></p> <p><i>[Avatar speaks turns away from participant slightly and speaks on the phone discreetly]</i></p> <p>- Hello? Okay . . . yeah I can be there . . . I can be there in like 20 minutes . . . okay . . . bye</p> <p><i>[Avatar ends phone call and turns to address participant again]</i></p> <p>Oh, sorry but I need to go, something's come up . . . anyway, thank you for coming and maybe we can continue another time? If that's ok with you?</p>
	<p><i>Scenario ends by fading to black</i></p>

Appendix 11: Contingency mapping participant behaviour and avatar responses: Current study vs. Fornells-Ambrojo et al. (2016)

Type of avatar responses that were retained and omitted in current study

Participant Behaviour	Avatar Responses
Participant moves head side to side (tilt)	Avatar tilts head in the same direction and returns head to original centre after participant has done so
Participant speaks	Avatar nods
Participant moves head in any other direction (back/front, up/down)	Avatar moves his body (random choice of back to front or side to side (sway))

Note. Row highlighted in grey reflects the contingency mapping that was included in the repertoire of the avatar in Fornells-Ambrojo et al.'s study but omitted from the current study due to a technical error.

Frequency of avatar responses in current study vs. Fornells-Ambrojo et al.

Triggered Avatar Responses	Overall Frequency	
	Current Study (<i>N</i> = 70)	Fornells-Ambrojo et al. (<i>N</i> = 63)
Head tilts	1034	836
Head nods	172	104
Front-to-back body movements	<i>Responses missing</i>	99
Left-to-right body movements	<i>Responses missing</i>	84
Total	1206	1123

Appendix 12: Participant demographic details form

Participant Information

Participant name:

Participant ID (to be completed by researcher):

Age:

Gender:

Ethnicity:

Occupation:

History of epilepsy:

1a) Have you ever had a diagnosed mental health difficulty?

- Yes
- No
- Prefer not to say

1b) If you answered yes to question 1a), please specify which mental health difficulty you have experienced:

.....

- Prefer not to say
- Not applicable

1c) If you answered yes to question 1a), is this mental health difficulty current?

- Yes
- No
- Prefer not to say
- Not applicable

2a) Have you previously lived in a shared flat?

- Yes
- No

2b) If you answered yes to question 2a), overall would you describe this experience as:

- Mainly positive
- Mainly negative
- Neutral

3. Have you had any previous experience of using Virtual Reality technology?

- Yes
- No

Appendix 13: Relationship Questionnaire (Bartholomew & Horowitz, 1991)

[REMOVED FOR COPYRIGHT REASONS]

Appendix 14: Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988)

[REMOVED FOR COPYRIGHT REASONS]

Appendix 15: Post-VR attention check measure

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 experience 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

Appendix 16: The Sense of Presence Questionnaire (Slater, Steed, McCarthy & Maringelli, 1998)

[REMOVED FOR COPYRIGHT REASONS]

Appendix 17: Post-VR subjective trust scale

How TRUSTWORTHY did Mark seem?

Not at
all

Very
much

1

2

3

4

5

6

7

Appendix 18: The Prospective Imagery Attachment Task (PIAT) script

Prospective Imagery Task Script

(read aloud by researcher, not given to participants)

PREAMBLE

In a moment, I will read out a script that guides you to imagine future scenarios. These scenarios will relate to the flat that you just saw and the person called Mark who you just met in virtual reality.

I would like you to try to imagine each future scenario that I describe in as much detail as possible so that they look like a film playing in your mind. Please try to imagine the scenes as if you are viewing them through your own eyes, not from someone else's perspective.

Sometimes it can be difficult to create mental images so don't worry if your image is vague or fleeting. If you lose it, just bring it back to your mind and try to make it as life-like as possible again. If you find it hard it's ok, just try the best you can.

After describing each future scenario, I will leave a pause so that you have some time to imagine it. I will then ask you to rate two things. First, I will ask how vivid the image is in your mind. Just so we have the same understanding of what we mean by 'vividness', it means how clear and distinct the image appears in your mind. How similar is it to seeing something in real life. *[Show participant the laminate with the definition written down]* Second, I will ask your opinion about how likely it is that the scenario would happen in the future.

For both questions, the ratings will range from 0-100, with 0 meaning 'not at all' and 100 being 'extremely' *[Show participant the laminate with the rating scale written down, along with verbal anchors]*.

[The rating scale and vividness definition laminates will be available for Ps to refer to throughout the task]

PRACTICE

Let's practice first. Close your eyes if you feel comfortable with this. Remember to imagine the scene as if you are viewing it through your own eyes, not someone else's perspective. For example, if you were to look down during the scene, you would see your own body. I'd like you to create an image in your mind of something neutral that might happen in the future. Imagine yourself watching television while sitting on a sofa, just like the one you saw in Mark's flat.

Have you got an image of that scene in your mind now? → Yes/No

Could you briefly describe what you see in this scene through your own eyes please?

How vivid is the image? → 0-100

How likely is it that you would sit on your sofa watching TV like this in the future? → 0-100
Now that you've had a chance to practice, we can start with the main part of the task. In total, we will work through nine brief scenarios together. Do you have any questions before we start the actual task? Are you ready to get started?

Eliciting the Attachment Behavioural System

Introducing a Relationship with Mark

I would like you to imagine a future scenario in which you have moved into the flat with Mark. You have been flatmates for a few months. You get on with him and things in the flat are going well. Imagine yourself sitting on the sofa and watching your favourite TV show together one evening. ***WAIT 8 seconds***

How vivid is the image? → 0-100

How likely is it that you would sit on the sofa and watch TV with Mark like this? → 0-100

All of the steps that follow will be based on this future scenario that you have been Mark's flatmate for a few months and you get on with him. Some of these scenarios will ask you to imagine your side of a relationship with Mark. Others will ask you to imagine how he might respond to you.

Introducing a Sense of Mild Threat/Distress

Now, imagine that in this future scenario you have recently had an interview for a job that you really wanted. On your way home, while you are walking up the street towards your flat, you get a call from the interview panel. They tell you that you have not been successful and that they have offered the job to another candidate. The call has just ended. Imagine that, as you put your phone away, you feel sad at missing out on the job and worried about the future. ***WAIT 8 seconds***

How vivid is the image in your mind? → 0-100

How likely is it that you would feel sad and worried about not getting a job like this? → 0-100

1. Physical Proximity Seeking

Immediately after hearing the negative news about the job, imagine that you are walking through the front door of your flat. You are feeling sad and worried about not getting the job. You look across the living room and, through the glass doors, you see Mark sitting outside at the table on the terrace. Imagine walking into to your bedroom because you want to be alone. ***WAIT 8 seconds***

How vivid is the image? → 0-100

How likely is it that you would go to your bedroom to be alone like this? → 0-100

I would like you to rewind this scenario to the point where you walk through the front door of your flat. You are feeling sad and worried about not getting the job. You look across the living room and can see Mark sitting at the table on the terrace through the glass doors. This time, imagine walking over to the terrace to sit down next to him. ***WAIT 8 seconds***

How vivid is the image in your mind? → 0-100

How likely is it that you would go over to sit down next to Mark like this? → 0-100

2. Emotional Disclosure of Distress

Later on in the evening, you and Mark are both sitting on the sofa in the living room watching TV. Mark asks you: "how was your day?" The memory of the phone call with the interviewer comes back into your mind. Imagine that you choose not to share your upsetting news about the job and simply reply to Mark by saying "my day's been ok". ***WAIT 8 seconds***

How vivid is the image? → 0-100

How likely is it that you would choose not to share your upsetting news with Mark like this? → 0-100

I would like you to rewind this scenario to the point where you are both sitting on the sofa in the living room watching TV and Mark asks: "how was your day?" Again, the memory of the upsetting news about the job comes back into your mind. Imagine that, this time, you reply to Mark by confiding in him. You tell him that you are feeling disappointed and worried about what to do next because you had really hoped to get that job. ***WAIT 8 seconds***

How vivid is the image? → 0-100

How likely is it that you would confide in Mark like this? → 0-100

3. Emotional Experience following Emotional Disclosure of Distress: Comforted

You are still sitting next to Mark on the sofa with the TV playing in the background. Imagine that you have just finished describing the upsetting news about the job to him. ***WAIT 8 seconds***

How likely is it that you would feel comforted after opening up to Mark like this? → 0-100

4. Anticipation of a Sensitive Response

Imagine that, after you open up to Mark about not getting the job, you notice that he seems distracted by the TV. He doesn't look like he has paid full attention to what you have just said. ***WAIT 8 seconds***

How vivid is the image? → 0-100

How likely is it that Mark would seem distracted after you had opened up like this? → 0-100
I would like you to rewind this scenario to the point where you have just finished opening up to Mark about not getting the job. This time, imagine that he gives you his full attention, saying things that are supportive and encouraging. ***WAIT 8 seconds***

How vivid is the image? → 0-100

How likely is it that Mark would respond in a supportive way after you had opened up like this? → 0-100

We have now come to the end of the task. Thank you for taking part.

Do you have any questions you would like to ask about the task?

Do you have any feedback based on your experience of doing the task just now?

**Appendix 19: Non-parametric correlational analyses for the Prospective
Imagery Attachment Task likelihood items and insecure-dismissing attachment**

Likelihood Item	Insecure-Dismissing Attachment	
	r_s	p
Physical Proximity Seeking	-.239*	.046
Emotional Disclosure	-.266*	.026
Feeling Comforted after Emotional Disclosure	-.256*	.026
Anticipated Sensitivity of Mark's Response	-.229	.056

Note. * = significant association under the $p = .05$ threshold. Bonferroni correction was applied to establish more stringent threshold for inferring statistical significance: $\alpha_{\text{altered}} = (.05/8) = .006$

Appendix 20: Assessment of normality for key variables

Variable	Skewness	Kurtosis	K-S Test		Outlier Values
			D	p	
<i>Pre-VR</i>					
RQ Secure	-.593	-.508	.201	.000	N/A
RQ Fearful	.014	-1.107	.129	.006	N/A
RQ Preoccupied	.008	-1.161	.156	.000	N/A
RQ Dismissing	-.504	-1.007	.217	.000	N/A
PANAS Positive	.037	-.083	.058	.200	Case 3
PANAS Negative	1.192	1.131	.197	.000	Case 8
<i>During VR</i>					
Total no. Avatar Movements	.633	-1.036	.246	.000	N/A
Average Interpersonal Distance	1.175	1.111	.159	.000	Cases: 7, 16, 23, 28, 46, 54, 56, 65, 67
<i>Post-VR</i>					
PANAS Positive	.066	-.865	.130	.005	N/A
PANAS Negative	1.809	2.910	.244	.000	Cases: 1, 7, 8, 11, 35, 45, 57
Subjective Trust	-.365	-.933	.231	.000	N/A
PIAT: Average Vividness	.160	.491	.071	.200	Cases: 42 & 66
PIAT: Seeking Physical Proximity	-.345	-.075	.103	.062	Case 12
PIAT: Not Seeking Physical Proximity	-.550	-.811	.150	.000	N/A
PIAT: Making Emotional Disclosure	-.780	.844	.147	.001	Cases: 5 & 41
PIAT: Not Making Emotional Disclosure	.029	-1.172	.125	.008	N/A
PIAT: Sensitive Response	-.898	.949	.199	.000	Cases: 49 and 67
PIAT: Insensitive Response	-.217	-.280	.105	.055	N/A
PIAT: Physical Proximity Seeking*	-.029	-.383	.089	.200	N/A
PIAT: Emotional Disclosure*	.071	-.794	.104	.060	N/A
PIAT: Feeling Comforted after Emotional Disclosure	-.154	-.682	.133	.003	N/A
PIAT: Sensitive Response*	-.096	.020	.079	.200	N/A

Note.

Degrees of freedom = 70. Variables in grey are those that were central to the research hypotheses and analyses.

* Represents normality statistics for final composite likelihood measures (e.g. PIAT: Physical Proximity Seeking = (perceived likelihood of seeking physical proximity + not seeking)/2).

**Appendix 21: Non-parametric partial correlations covarying for contingency
condition and total avatar movements**

These correlation analyses are applied for the interpersonal distance outcome only because the two contingency conditions did not differ significantly in the average subjective trust outcome

Attachment and Average Interpersonal Distance in VR

Attachment Style	Average Interpersonal Distance [*]	
	r_s	p
Secure	.830	.376
Insecure Dismissing	.005	.971

^{*} Average Interpersonal Distance = mean distance from the avatar in phase of VR scenario after he invites the participant to view the terrace of the flat with him. Coefficients for this variable represent non-parametric partial correlations, covarying for contingency condition and total avatar movements.

Attachment-Focused Prospective Imagery Task Items and Interpersonal Distance in VR

Likelihood Item	Average Interpersonal Distance ⁺	
	r_s	p
Physical Proximity Seeking	-.051	.678
Emotional Disclosure	-.190	.120
Feeling Comforted after Emotional Disclosure	-.334 ^{**#}	.005
Anticipated Sensitivity of Mark's Response	-.142	.248

Note. ^{*} $p \leq .05$, ^{**} $p \leq .01$, [#] significant associations within the threshold set by the Bonferroni correction ($\alpha_{\text{altered}} = (.05/4) = .013$).

⁺ Average Interpersonal Distance = mean distance from the avatar in phase of VR scenario after he invites the participant to view the terrace of the flat with him. Coefficients for this variable represent non-parametric partial correlations, covarying for contingency condition and total avatar movements.

**Appendix 22: Correlation matrix for vividness ratings on the Prospective
Imagery Attachment Task**

PIAT Item	Practice	Positive Relationship with Mark	Establishing Threat	Physical Proximity: Alone	Physical Proximity: Join	Emotional Disclosure: Not Share	Emotional Disclosure: Share	Anticipated Response: Insensitive	Anticipated Response: Sensitive
Practice	-								
Positive Relationship with Mark	.611 ^{***#} (<i>p</i> = .000)	-							
Establishing Threat	.311 ^{**} (<i>p</i> = .009)	.421 ^{***#} (<i>p</i> = .000)	-						
Physical Proximity Seeking: Alone	.414 ^{***#} (<i>p</i> = .000)	.440 ^{***#} (<i>p</i> = .000)	.594 ^{***#} (<i>p</i> = .000)	-	-	-	-	-	-
Physical Proximity Seeking: Join	.479 ^{***#} (<i>p</i> = .000)	.587 ^{***#} (<i>p</i> = .000)	.505 ^{***#} (<i>p</i> = .000)	.491 ^{***#} (<i>p</i> = .000)	-	-	-	-	-
Emotional Disclosure: Not Share	.302 [*] (<i>p</i> = .011)	.392 ^{***#} (<i>p</i> = .001)	.402 ^{***#} (<i>p</i> = .001)	.472 ^{***#} (<i>p</i> = .000)	.457 ^{***#} (<i>p</i> = .000)	-	-	-	-
Emotional Disclosure: Share	.232 ^{***#} (<i>p</i> = .000)	.440 ^{***#} (<i>p</i> = .000)	.332 ^{**} (<i>p</i> = .005)	.471 ^{***#} (<i>p</i> = .000)	.648 ^{***#} (<i>p</i> = .000)	.451 ^{***#} (<i>p</i> = .000)	-	-	-
Anticipated Response: Insensitive	.611 (<i>p</i> = .053)	.400 ^{***#} (<i>p</i> = .001)	.600 ^{***#} (<i>p</i> = .000)	.625 ^{***#} (<i>p</i> = .000)	.507 ^{***#} (<i>p</i> = .000)	.372 ^{**} (<i>p</i> = .002)	.417 ^{***#} (<i>p</i> = .000)	-	-
Anticipated Response: Sensitive	.147 (<i>p</i> = .223)	.412 ^{***#} (<i>p</i> = .000)	.406 ^{***#} (<i>p</i> = .000)	.402 ^{***#} (<i>p</i> = .001)	.554 ^{***#} (<i>p</i> = .000)	.479 ^{***#} (<i>p</i> = .000)	.646 ^{***#} (<i>p</i> = .000)	.547 ^{***#} (<i>p</i> = .000)	-

Note. Coefficients represent non-parametric Spearman's correlations (r_s).

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$, # significant associations within the threshold set by the Bonferroni correction ($\alpha_{\text{altered}} = (.05/36) = .001$).