Exploring the nature of the therapeutic alliance in technology-based interventions for mental health problems

Submitted for the degree of MPhil Health Research

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May 2018

Abstract: Exploring the nature of the therapeutic alliance in technology-based interventions for mental health problems

For the degree of MPhil Health Research, authored by Laura Hillier, and submitted May 2018.

Background: Digital technology is increasingly being used in healthcare delivery, and can potentially improve access to psychological services. "Technology-based interventions" (TBIs) are a form of self-guided psychological treatment delivered by digital technology, such as computer programs, websites, or smartphones. Little is known about how these work, and high drop-out rates raise a pressing need to understand user engagement. The therapeutic alliance concerns the level of collaboration in therapy, and is strongly linked to face-to-face treatment's effectiveness. The validity of therapeutic alliance is uncertain in TBIs, but it may contribute towards an understanding of user engagement.

Objective: To explore the nature of the therapeutic alliance in the context of technology-based interventions (TBIs) for mental health problems.

Methods: A systematic review was undertaken, which included qualitative, quantitative and mixed methods research. 13 papers were analysed using a best-fit framework synthesis approach. A qualitative study was also conducted, using topic-guided interviews to explore 13 participants' experiences regarding their interaction and engagement with TBIs. Thematic analysis was used to analyse the data.

Results: The user-TBI alliance is largely comprised of similar dimensions to the alliance in face-to-face therapy. There are also some new dimensions which specifically apply to TBIs: interactivity (personalising a TBI), and availability (flexible access to treatment). The user-TBI alliance may not be directly associated with outcomes, but it does appear to be related to user engagement.

Conclusions: TBI users can experience a therapeutic alliance with the digital technology, especially if the TBI is sufficiently personalised. The terminology of a "relationship" with digital technology is generally unacceptable to TBI users, which will pose challenges when attempting to adapt or design alliance measures that take account of the unique TBI context.

Word Count

Abstract, chapters, appendices (excluding references): 59390 words

Content of chapters: 48087 words

Appendices: 10995 words

References: 11087 words

Full document: 72267

Acknowledgements

Declaration by Student

I, Laura Hillier, declare that this thesis is my own work, and has not been submitted in substantially the same form for the award of a higher degree elsewhere.

No sections of this thesis have been submitted for publication in an academic journal at this time. Sections of this thesis will be submitted for publication in the Journal of Medical Internet Research in the future.

The Statement of Authorship outlines my contributions towards the research and writing of this thesis, as well as confirmation from other authors regarding their contributions.

Name: Laura Hillier

Date: 28th September 2017

Signed:

Statement of authorship for thesis: Exploring the nature of the therapeutic alliance in technology-based interventions for mental health problems

As required by MARP, here is a full statement of authorship for each multi-authored publication in this thesis, accompanied by written certification by the other authors of each publication of the proportion for which credit is due the candidate for carrying out the research and preparing the publication.

The principal author of both these chapters is the MPhil candidate, Laura Hillier (LH). The project's primary supervisor was Professor Fiona Lobban (FL), and was also supervised by Professor Steven H. Jones (SJ) and Professor Dave Dagnan (DD). Barbara Mezes (BM) also provided input to the systematic review chapter.

Title of chapter: The nature of the human-technology relationship in technology-based interventions for mental health problems: a systematic review and best-fit framework synthesis

The principal author undertook the main tasks in undertaking this systematic review (designing the protocol, conducting the literature search, data extraction and analysis), as well as writing up the publication. FL, SJ and DD provided input and reflections on the systematic review's design, analysis, interpretation and article drafts. SJ also double-checked quality appraisal of the papers included in the systematic review. BM acted as the second researcher in screening the search results and double-checking data extraction.

Title of chapter: Exploring users' engagement and therapeutic alliance with technology-based interventions for mental health problems: A qualitative interview study

The principal author primarily undertook the tasks involved in conducting this qualitative interview study (designing the protocol, applying for ethical approval, recruiting and interviewing participants, transcription of the interviews, data analysis) as well as writing up the publication. FL, SJ and DD provided input and reflections on the study's design, analysis, interpretation and article drafts.

<u>Certification by other authors</u>

The signatures below provide certification from the other authors that the stated contributions to the publication are accurate, and permission is granted for the candidate to include these publications into this thesis.

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List of Abbreviations

ARM – Agnew Relationship Measure

BFFS – Best-fit framework synthesis

CBT – Cognitive behavioural therapy

cCBT – Computerised cognitive behavioural therapy

GP – General practitioner

IPA – Interpretative phenomenological analysis

MMAT – Mixed-methods appraisal tool

NHS – National Health Service

NICE – National Institute for Health and Care Excellence

RCT – Randomised controlled trial

SIS – Session Impacts Scale

TBI – Technology-based intervention

WAI – Working Alliance Inventory

Introduction - Therapeutic alliance in technology-based interventions: why does it matter?

This chapter is designed to give the reader an understanding of the issues forming the setting for this thesis, which explores the nature of the therapeutic alliance in technology-based interventions for mental health problems. The chapter will discuss the wider role of digital technology in society and healthcare, self-help approaches to healthcare, and a detailed outline of the type of technology-delivered intervention that has been researched in this thesis. It will also provide a rationale for the importance of understanding how people engage with digital technology, and why the concept of therapeutic alliance may be useful in this context. It is my intention that this chapter will serve as a "frame" through which to read the rest of the thesis, and to illustrate why the present research is vital.

1.1 Digital technology in society and health

Firstly, this research must be situated against the backdrop of the pervasiveness of digital technology in wider society. Ofcom's Communications Market Report (2015) is an analysis of the UK communications sector, and is a useful place to begin considering the reach of communication technology in regular citizens' lives in the UK. The survey found that nearly 8 in 10 households have broadband connectivity, and smartphones are now the most widely-owned device with internet capabilities, alongside laptops (around 65% of households). Whilst there remains a digital divide in terms of digital technology usage in Western countries compared with developing countries, data indicate that smartphone ownership and internet access is continuing to rise in developing countries (Pew Research Centre, 2016). Across the world, more people now have access to a mobile phone than to the electrical grid or clean water (World Economic Forum, 2011).

Digital technology has also been increasingly used as part of healthcare; 51% of adults in the UK are now using the internet to look for health information (Office for National Statistics 2016). Strategies published recently by the Department of Health have promised online access to health records, as well as online appointment scheduling and the ordering of repeat prescriptions services from general practices (Department of Health, 2012). The public health initiative, "Digital First", highlights the possibility of using digital data to track epidemiological outbreaks and the

benefits of engaging with patients digitally (Public Health England, 2017). Barak, Klein, and Proudfoot (2009) also outline multiple explanations for the growth in delivery of therapeutic interventions online, such as: increasingly positive perceptions of the internet as a social tool; the continual improvement of technology; and the establishment of ethical guidelines and training opportunities by professional bodies. It appears that technology is gradually becoming a part of mental health care delivery, and indeed, Firth, Torous, and Yung (2016) point out the rising interest in e-mental health.

1.2 Digital technology in mental health services

Technology's increasing role in mental health services has been noted in government documents about the direction of mental health care. In the Chief Medical Officer's Annual Report, Hollis et al. (2013) state that through technological innovation, mental health service delivery could be transformed. There are opportunities for large amounts of useful data to be generated by the use of digital technology, which would be invaluable for mental health research (Hollis et al., 2013). The use of a mobile device could also allow for more reliable assessment of symptoms using real-time monitoring (Hollis et al., 2013). The white paper "No Health Without Mental Health" (Department of Health, 2011) also outlines several ways digital technology may be productive in mental health: health-related information can be shared online; technology can connect people for peer support; methods for data collection can be improved; and it may offer a less stigmatising way of accessing treatment.

The use of digital technology may present a way of tackling the longstanding issue whereby many people with mental health problems do not receive any appropriate treatment or support. For example, it is estimated that only a third of people suffering with depression receive any kind of treatment (The Mental Health Policy Group, 2015). Many reasons may underlie this reduced access to appropriate treatment, such as an insufficient number of clinicians, long waiting lists, clients being unable to adhere to the requirements of attending therapy in-person, or stigma (Andrade et al., 2014; Andrews, Cuijpers, Craske, McEvoy, & Titov, 2010; Kaltenthaler et al., 2008; Plaistow et al., 2014). Furthermore, 9-5 work schedules may make it difficult for people to access cognitive behavioural therapy (CBT;

Lovell & Richards, 2000). Technology could help overcome this issue by extending beyond the reach of traditional psychological treatment that is delivered in a clinic during office hours. Recommendations set out by The National Institute for Health and Care excellence (NICE) about improving access to services suggest that technology could be used to encourage people that find it difficult to attend a specific service (NICE, 2011). The World Psychiatric Association explain that the use of digital technology could improve access to mental health care in multiple ways, such as: more efficient delivery of services; increased methods for communication with patients; and more equitable access to services, as therapy can be accessed at a greater range of locations and times (World Psychiatric Association, 2017).

As one example, CBT can be delivered primarily by a computerised interface, rather than by a human therapist. Computerised CBT (cCBT) permits flexibility in methods of treatment provision: people that do not wish to see a therapist can have that instead; it can be delivered at home; and requires less therapist time (NICE, 2006). It seems that CBT delivered via technology can be accessible and convenient for both patients and clinicians (Andrews et al., 2010). Since cCBT can be delivered by other professionals, burden on CBT therapists could be reduced (Stallard, Richardson, & Velleman, 2010). For example, McClay et al.'s (2013) study of online CBT for bulimia delivered by non-clinical support workers showed this was perceived as acceptable. CCBT can also be an effective option for service users whilst they are waiting to receive face-to-face treatment (Twomey et al., 2014). NICE (2011) has outlined a stepped care model for the treatment of common mental health issues, and recommends cCBT as an option for mild-moderate depression or anxiety problems.

1.3 Technology-based interventions – what are they?

As noted above, there are a range of ways in which digital technology can be used in healthcare. At this point, it is necessary to explain and define the type of technology in healthcare that this thesis will focus upon.

It should be made clear that I am not focusing on treatments which involve digital technology but still have a human-human interaction at their heart. These might be termed "e-therapy", which is defined as "a licensed mental health care professional providing mental health services via e-mail, video conferencing, virtual

reality technology, chat technology, or any combination of these" (Manhal-Baugus, 2001, p. 551). The term "online therapy" has also been used to describe a similar approach as "any type of professional therapeutic interaction that makes use of the Internet to connect qualified mental health professionals and their clients" (Rochlen, Zack, & Speyer, 2004, p. 270). An example of this approach is the use of videoconferencing software to provide psychological services to people living in remote places (see Richardson, Frueh, Grubaugh, Egede, & Elhai, 2009 for an overview of videoconferencing). E-therapy or online therapy does not fall within the scope of this thesis. This is because I have chosen to focus on those interventions that are delivered by digital technology, but are primarily *self-guided*.

Barak et al. (2009) provide an extremely helpful and comprehensive overview of the range of internet-supported therapeutic interventions in existence. One of their categories is termed "web-based interventions", and it is this style of intervention focused upon by this thesis. Web-based interventions are described as having a range of applications, covering prevention, promotion, and education for physical and mental health problems. The essence of their nature is summarised as follows (Barak et al., 2009, p. 5):

"a primarily self-guided intervention program that is executed by means of a prescriptive online program operated through a website and used by consumers seeking health- and mental-health related assistance. The intervention program itself attempts to create positive change and or improve/enhance knowledge, awareness, and understanding via the provision of sound health-related material and use of interactive web-based components"

The four major components of these web-based interventions are the content of the program; the use of multimedia; the provision of interactive activities; and the presence of guidance and supportive feedback (Barak et al., 2009). Educational or therapeutic content is usually delivered in a modular and structured way, and they may even make use of algorithms to provide feedback which is tailored to individual users. Importantly, these are primarily *self-guided*, although there may be some assistance provided from a supporter (see Section 1.5 below for a more detailed discussion of supporters), perhaps to get started with the intervention, or to provide the user with some feedback over the treatment course. Although web-based

interventions can vary between themselves on the manifestation of the above dimensions, they all share the common goal of creating positive change for their users, in a cognitive, behavioural and emotional sense (Barak et al., 2009).

It should also be noted that interventions falling under this category have received many different labels, and there is currently limited agreement about which terminology should be used formally for different interventions (Ritterband, Andersson, Christensen, Carlbring, & Cuijpers, 2006). I have chosen to use the terminology of Kiluk, Serafini, Frankforter, Nich, and Carroll (2014) a "technology-based intervention" (TBI). This is because the word "technology" was deemed to be sufficiently inclusive to cover a range of self-guided interventions that may not require use of the internet, such as certain smartphone applications or computer programs which are installed onto a computer. Whilst I acknowledge that it is likely that most interventions *will* involve internet access, I did not want to rule these out by researching only "web or "internet" based interventions.

Part of the decision to focus on TBIs is because the central aim of the thesis is to examine the therapeutic alliance in a new technological treatment context. I felt it was fascinating to investigate the therapeutic alliance concept as it applies to a piece of digital technology, rather than a human therapist. Another part of the decision to focus on these types of intervention was due to their inclusion in the National Health Service (NHS), as they are recommended by NICE as an option in the management of mild-moderate depressive and anxiety disorders (NICE, 2011).

As an illustration, here is a brief profile of a TBI that is currently provided in some NHS mental health services. Silvercloud (Silvercloud Health, 2017) offers programmes to support people with anxiety, depression, stress, eating problems or chronic illness. Richards et al. (2015) describe the seven modules of Silvercloud's *Space from Depression* program, which is based on CBT. For instance, the modules include: mood monitoring and understanding emotions; tracking thoughts; exploring the relationship between cognition and mood; behavioural activation; and the challenging of negative thinking patterns.

1.4 Are TBIs effective?

The most commonly researched TBIs for mental health conditions focus on anxiety and depression (Hedman, Ljótsson, & Lindefors, 2012), with systematic

reviews finding generally that TBIs are effective, feasible and acceptable for this population, at least compared to a waiting list (for example, Andersson & Cuijpers, 2009; Arnberg, Linton, Hultcrantz, Heintz, & Jonsson, 2014; Hedman et al., 2012). Although less well-researched, some reviews also suggest preliminary evidence that online approaches can be effective and acceptable for people with psychosis and severe mental illness (Alvarez-Jimenez et al., 2014; Naslund, Marsch, McHugo, & Bartels, 2015; Schlegl, Bürger, Schmidt, Herbst, & Voderholzer, 2015). There is also evidence of TBI effectiveness for problematic alcohol consumption (Riper et al., 2011), cannabis usage (Tait, Spijkerman, & Riper, 2013) and eating disorders (Hedman et al., 2012). A review of reviews on the use of cCBT for depression has cautiously concluded that the evidence base shows that it is an effective approach, although there were some questions raised about comparisons between cCBT packages and limited available information about cost-effectiveness (Foroushani, Schneider, & Assareh, 2011).

It is also worth examining whether TBIs remain effective outside the settings of a research trial, as a trial setting may give participants added motivation to engage with the program which might not be present in real-world settings. Cavanagh et al. (2006) found that cCBT was effective for reducing symptoms of anxiety and depression when used in routine care. Similarly, a study by Shandley et al. (2008) found that when people were supported to use "Panic Online" by their general practitioners (GPs), clinically significant improvement was still achieved. Additionally, Elison et al. (2017) investigated online self-help provided in real-world clinical settings, finding improvements in symptoms for those using TBIs for either substance misuse, insomnia, or stress, low mood and anxiety. On the other hand, Gilbody et al. (2015) did not find any more benefits of cCBT above usual GP care for depression in a pragmatic, commercially-independent trial. It is therefore unclear whether TBIs will be consistently effective in real-world services, and further research is probably required to untangle when TBIs will be effective, and for whom.

It is also necessary to research the cost-effectiveness of TBIs, since the use of digital technology has been suggested to reduce the treatment delivery gap and provide more people with therapy. However, the evidence is not currently at all conclusive. Some systematic reviews have shown that TBIs can be cost-effective for a range of clinical issues (for example, Donker et al., 2015; Hedman et al., 2012).

Other reviewers have been less optimistic, and are hesitant to draw conclusions about cost-effectiveness due to limited available data (for example, Arnberg et al., 2014; Foroushani et al., 2011).

1.5 Role of a "supporter"

This section will give an overview of several dimensions along which human support provided to TBI users can vary, including: the amount of support time; frequency; the nature of support; and the supporter's qualifications. It is necessary to explain variety in support provision, since many different terms for TBIs exist which may not have a consistent meaning across reports in terms of the type of support provided. It is also worth noting that the support can be provided via a range of communication modalities, such as via phone, videoconferencing software, email, instant messaging, or in person (Andersson, 2016; Barak et al., 2009).

1.5.1 Effectiveness

TBIs that have a supporter involved often show higher effect sizes, compared to entirely standalone packages (Baumeister, Reichler, Munzinger, & Lin, 2014), and correlations have been found between the amount of support time provided and the effect size of the TBI (Palmqvist, Carlbring, & Andersson, 2007), although there have been some exceptions (for example, Berger et al., 2011). The provision of support can also lead to a higher amount of TBI completion (Alfonsson, Olsson, Linderman, Winnerhed, & Hursti, 2016; Baumeister et al., 2014; Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012; Richards & Richardson, 2012). Qualitative studies have revealed the value of support to use cCBT for depression, for example, as it was experienced as helping with motivation and emotional support (Knowles et al., 2015). This has been enshrined in guidance for the use of TBIs in clinical practice; NICE (2011) recommendations about the use of cCBT state that it should be supported by a trained practitioner.

1.5.2 Amount of support time

The amount of human support time provided to users varies enormously, and is a frequently discussed dimension of TBIs (Palmqvist et al., 2007). Users may only receive a couple of minutes of contact from a supporter (e.g. Clarke et al., 2005), or several hours of support (e.g. Klein et al., 2009). Interestingly, a TBI user may

receive a comparable amount of therapist time as someone receiving face-to-face therapy (Palmqvist et al., 2007).

Newman et al. (2011) provide an outline of some different levels of support provided to TBI users and the time involved, which adapts Glasgow and Rosen's (1978) description of self-help books. In the case of "self-administered" interventions, a therapist is only involved at assessment. "Predominantly-self-help" interventions involve a very limited amount of support time – a maximum of 1.5 hours over the treatment duration - which is spent supporting the user to learn how to use the technology, or coaching them on its therapeutic tools. "Minimal contact" interventions require more than 1.5 hours of support time, involving the therapist helping the user to apply therapeutic techniques. The final category is "predominantly therapist-administered" interventions, in which the self-help tool is used adjunctively to face-to-face therapy, involving a large amount of therapist time (Newman et al., 2011).

What remains unclear is the amount of therapist time which is optimal, and the point at which additional contact time does not result in additional benefits (Palmqvist et al., 2007). The topic is further complicated since the amount of support time received by a TBI user is often not reported in detail by researchers; doing so would be a welcome improvement to the literature (Palmqvist et al., 2007).

1.5.3 How often is support provided?

Related to the amount of support time is how frequently this support is given, as this can range from a one-off session during treatment to several times per day (Barak et al., 2009). This also links to the communication medium employed to contact users, as this influences response speed (Barak et al., 2009). Titov et al. (2009) compared the effectiveness of a social phone TBI when provided with synchronous support (weekly phone call from a technician) versus asynchronous support (three forum posts per week from a clinician), and found no difference in symptomatic outcome or level of TBI completion. While this suggests that the timing of support provision may not impact outcomes, Titov et al. (2009) did not control for the different qualifications of the supporter across the groups (see Section 1.5.5 below for relevant discussion). There is limited research examining the

frequency of support (Baumeister et al., 2014), and thus it is currently impossible to draw definitive conclusions.

There have also been some creative suggestions for the "dose" of support provided. Rather than a "linear dosing scheme" (i.e. the same amount of contact at regular intervals), could it be fruitful to provide a higher degree of support at the beginning of the treatment program, and then gradually guide the user towards self-management (Baumeister et al., 2014)? Andersson (2016) notes that providing support upon request might also be promising, as TBI users will then receive support only when it is needed. Zarski et al. (2016) offered this as a support condition in their randomised controlled trial (RCT) of a stress management-based TBI, and this was found to be equivalent in terms of adherence rates to the group receiving regular therapist-initiated feedback. This has implications for cost-effectiveness, as the user-initiated condition involved substantially less therapist time (Zarksi et al. 2016).

1.5.4 Nature of support

In Barak et al.'s (2009) overview of web-based interventions (see Section 1.3), different ways in which supporters can interact with users of TBIs are described. In a "minimal" or "partial" situation there might only be reminders to complete tasks, very simple questions answered, or moderating forum boards. In a "high" support scenario, there may be a large degree of tailored or prescriptive feedback provided, which involves a lot of therapist time. Alternatively, the TBI might be provided with no human support whatsoever, with automated feedback from the program provided at most (Barak et al., 2009).

As outlined in Section 1.5.2 above, Newman et al. (2011) has outlined several methods of providing TBIs with support. To recap the details of these pertaining to the *nature* of support provided, these are: self-administered (TBI is the only component of treatment; human contact only for data collection or assessment); predominantly self-help (post-assessment, a therapist only contacts users periodically, perhaps to instruct on use or explaining TBI rationale; limited to 1.5 hours); minimal contact (active contact from a therapist, involving more than 1.5 hours of assistance to apply therapeutic techniques); and predominantly therapist-administered (the TBI is adjunctive to face-to-face treatment).

In this way, it is possible to think about the degree of *interactivity* in the support provided – does the supporter provide limited/generalised information, or detailed, personalised feedback? Interestingly, Zarski et al. (2016) found no difference in adherence rates between the "content-focused guidance" condition (personalised regular feedback for each module + adherence monitoring) and the "adherence-focused guidance" condition (adherence monitoring/reminders, and personalised feedback upon user request). However, both these conditions were fared better than the "administrative guidance" condition (technical support only). Further research is needed to explore the level of interactivity in the support received by TBI users.

1.5.5 Qualifications of supporters

Support is often provided by health professionals, but peers ("informed" supporters – perhaps via forums or online communities) are also being placed to support TBI users (Barak et al., 2009). The supporter's qualification may influence delivery costs (Palmqvist et al., 2007), but perhaps does not make a difference in terms of TBI effectiveness, or the degree of TBI completion achieved by users (Baumeister et al., 2014). However, Baumeister et al. (2014) do note the methodological limitations present in the current research, so it may be premature to conclude the irrelevance of a supporter's qualifications.

Whilst we can at least say support appears to benefit TBI users, there is still much to learn about how support can best be provided (Baumeister et al., 2014). This thesis focuses on primarily *self-guided* TBIs, covering the first two categories of Newman et al. (2011 - "self-administered" and "predominantly self-help). This is due to the thesis aim to explore the human-technology alliance, and it was felt that it would be easier to examine this with a reduction in the influence of a human supporter (see Sections 1.11 and 2.2.2.3 for further discussion).

1.6 The "digital divide"

Whilst all of this sounds promising, digital technology in mental health care might not be a magical solution to the issue of improving the reach of healthcare delivery. There have been several concerns raised about technology, and I will begin by acknowledging the "digital divide".

By "digital divide", it is meant that certain groups of people may be disadvantaged as a result of services moving online; certain groups may not have easy access to the internet or computer to access online mental health services, such as homeless people, older adults, or people with intellectual disabilities (Hollis et al., 2013). When examining the digital divide, it is important to think about who is able to access information and communication technology in a meaningful and effective way, and under what circumstances this occurs (Selwyn, 2004).

Older adults may be disproportionately excluded from e-health developments, as young people that grew up with technology ("digital natives") may be more comfortable with using it (Kontos, Blake, Chou, & Prestin, 2014). Studies have shown adults aged between 18-49 were at least 2.5 times as likely to use the internet to search for health information than adults aged 65 and over (Kontos et al., 2014), and those with higher e-health literacy tend to be younger (Neter & Brainin, 2012). Older adults that do not use ICT may not do so because they feel anxious with technology (Vroman, Arthanat, & Lysack, 2015). Where older adults *do* access the web, it appears they are interested in using it for health purposes. Tennant et al. (2015) found that 90% of older web users reported using it for health information, and Vroman et al. (2015) found that health information was the second most popular reason for using the internet among their older adult sample. Crucially, a study of online self-guided treatment for anxiety and depression demonstrated that this method of treatment was effective and satisfactory for older adults (Titov et al., 2016). Taking these findings together, it seems that efforts should be made to ensure that older adults are considered in e-health developments.

Age is not the only variable relevant to the digital divide, since there is also variation amongst young people's digital literacy. Hargittai (2010) challenged the notion that young people are universally skilled at the use of information technology; young people's online skills were found to be influenced by other characteristics such as their socio-economic status. Similarly, indicators of socio-economic status such as education have been found to be associated with e-health usage in other studies (Kontos et al., 2014; Neter & Brainin, 2012).

With regard to homelessness, it is often assumed that homeless people are disadvantaged by digital health developments, perhaps due to difficulties in

accessing computers and the internet. However, Rhoades, Wenzel, Rice, Winetrobe, and Henwood (2017) found that mobile phone ownership amongst homeless adults is fairly high, and that they have similar smartphone ownership levels to the general population. Research about the use of mobile phones to support medication adherence has evidenced the acceptability of this method to homeless people with comorbid substance use and psychiatric disorders (Burda, Haack, Duarte, & Alemi, 2012). As smartphones have internet connectivity, they may present a useful way to make healthcare *more* accessible to homeless people.

There may also be issues with digital technology that disproportionately affect those that online mental health interventions are intended to help. For example, a systematic review found that the web might be less accessible to people with mental health problems, owing to issues of how difficult a webpage might be to navigate or understand, by the use of confusing designs and an overwhelming amount of information (Bernard, Sabariego, Baldwin, Abou-Zahra, & Cieza, 2015). However, technology use in people with serious mental illness is comparable to the general population (Naslund, Aschbrenner, & Bartels, 2016). Additionally, people with intellectual disabilities report some barriers present in digital technology use, such as complexity in design and a lack of support to use computers (Tanis et al., 2012). To overcome this, adaptations can be made to digital technology devices such as mobile phones to make them easier to use by people with intellectual disabilities (Stock, Davies, Wehmeyer, & Palmer, 2008); a trial of a CBT-based computer game adapted for people with intellectual disabilities demonstrated a significant reduction in users' anxiety symptoms (Cooney, Jackman, Coyle, & O'Reilly, 2017). It has also been found that people with intellectual disabilities perceive benefits of including computers in therapy, as a way of overcoming verbal communication barriers and making therapy more enjoyable (Vereenooghe, Gega, & Langdon, 2017). Therefore, we should be careful not to make assumptions regarding the abilities and preferences of people with mental health problems or intellectual disabilities, but developers should consider issues of usability when designing interventions, and ensure that interventions undergo rigorous user testing.

1.7 Other concerns about digital technology in health

Concerns and risks about technology in healthcare are not limited to issues of the digital divide. In this section I will discuss a selection of these, including the monitoring of risk, misinformation on the internet, and privacy of information.

Firstly, there have been concerns that the monitoring of risk is more difficult when an intervention is delivered online. Many practitioners have cited fears about a reduced ability to detect a worsening in a client's mental state when treated via technology (for example, MacLeod, Martinez, & Williams, 2009). This issue was discussed by Andrews and Williams (2015), who point out that suicidal feelings are common in people with major depression. Symptom monitoring features in online CBT programs can send alerts to clinicians if someone's mood deteriorates, which does not happen if people are on medication alone (Andrews & Williams, 2015). As such, they argue it can be unethical to refuse people internet-delivered treatment if they have suicidal thoughts. As evidence shows that internet-delivered CBT reduces suicidal feelings (Williams & Andrews, 2013), it could be tentatively suggested that offering treatment online is at least preferable to doing nothing at all.

There is also the risk of misinformation when accessing the internet for health information (Eysenbach, Powell, Kuss, & Sa, 2002). The quality of information available online about chest pain, for example, was found to be highly variable, revealing issues of comprehensiveness, referencing and clear authorship information (Joury, Alshathri, Alkhunaizi, Jaleesah, & Pines, 2016). Recent research demonstrated that 67.5% of websites about a range of mental health disorders were rated as having at least "good" quality content (Grohol, Slimowicz, & Granda, 2014). This still means that around a third of websites had poor quality information, and information about the risks of different treatment options was often omitted (Grohol et al., 2014). As access to appropriate mental health treatment may be hindered by structural barriers (Andrade et al., 2014), it is worrying that people may be misled or even receive damaging information if they turn to the internet for support instead.

Other concerns relate to the privacy of people's information when it is entered into online health interventions or websites. This may be of particular concern given the sensitive nature of mental health problems, as those with mental

health issues are still impacted across numerous domains by stigma (Sickel, Seacat, & Nabors, 2014). Worryingly, a study by Dehling, Gao, Schneider, and Sunyaev (2015) reviewing mobile health applications found that 95% of apps pose at least some risks to information security and privacy infringements. When people enter their data into websites (for instance, support forums for health issues) the ownership of the data often belongs to the site itself, and therefore can be commodified and profited from (see Lupton 2014b on the "digital patient experience economy"). Since for some people, one of the primary advantages of using digital technology in healthcare is the added privacy and anonymity (Beattie, Shaw, Kaur, & Kessler, 2009), issues around data security and protection should be taken very seriously. Patients' information must be stored confidentially and securely in digital approaches to mental health, in the same way it should be in traditional services (World Psychiatric Association, 2017).

As interest in digital technology's role in mental health grows, there have been calls for the development of ethical guidelines for the use of technology in mental health services and research (Jorm, Morgan, & Malhi, 2013). These guidelines may help to mitigate against some of the added risks outlined above. The American Psychological Association (2013) have developed some guidelines for the use of digital technology in mental health care. Included in these guidelines is an emphasis on practitioners' competency with the technology they are using, and the requirement that practitioners make efforts to mitigate against any added risks to confidentiality present in the telecommunication format used. The British Psychological Society (2017) have produced guidelines for the conduct of online research; researchers must inform participants about any added risks to their data, as well as considering carefully whether any data obtained from online sources can be deemed public or private.

The use of digital technology has also been said to represent a shift towards greater user responsibility for their own healthcare. For instance, Hollis et al. (2013) state that technological advances in mental healthcare present methods to "engage and empower" (p.74) people towards involvement in their treatment by doing things such as tracking their symptoms on their mobile devices. Lupton (2013) describes them as the "digitally engaged patient" that are able to take "control" over their health using digital technologies. This issue has been give critical consideration by

some authors, as employing narratives around "empowered" patients may at least partly represent attempts to place more responsibility for healthcare onto patients, rather than the state (Veitch, 2010). Given the current financial strain on healthcare institutions, narratives of "empowerment" could cynically be seen as primarily driven by the desire to save money. Despite this, approaches that encourage patient self-management may still be experienced positively by patients themselves.

1.8 Self-help

The focus of the medical model on the treatment of a patient's symptoms may not address everything that is most significant to that patient. For example, people with bipolar disorder place high value upon their quality of life and experiencing a fulfilling life despite their diagnosis, and feel that recovery goes beyond the treatment of their symptoms (Todd, Jones, & Lobban, 2012). Moreover, Villaggi et al. (2015) point out the range of strategies used by people with mood and anxiety disorders to achieve forms of recovery other than clinical recovery, such as social, functional, and existential recovery.

Self-help approaches such as peer-led support groups are valuable as they offer means of accessing support beyond the traditional medical encounter, providing both empathy and practical assistance (Munn-Giddings & McVicar, 2006). Besides, self-management may be viewed as a key part of the journey towards recovery, partly due to the expertise acquired by personal experience of having a condition such as bipolar disorder (Todd, Jones, & Lobban, 2013). The effectiveness of self-management has also been evidenced for people with a range of mental health needs, such as depression (Williams et al., 2013), social anxiety disorder (Furmark et al., 2009), and serious mental illness (Lorig, Ritter, Pifer, & Werner, 2014).

The inclusion of digital technology can play a significant role in self-management approaches to healthcare, and some features of technology that can be particularly beneficial. The focus groups of Todd et al. (2013) concerned what service users wanted from a self-management intervention in bipolar. Participants recommended that the internet was the best format, owing to its interactive capabilities and higher likelihood of holding users' attention. Accessing online self-management may have some notable advantages in terms of flexibility. This suggestion is supported by interviews with users of cCBT, as being able to engage in

therapy more flexibly and in your own time was perceived positively (Beattie et al., 2009; Gerhards et al., 2011; Holst et al., 2017; MacGregor, Hayward, Peck, & Wilkes, 2009). Digital technology may also be useful because of the enhanced feelings of privacy and anonymity, and some people might find it easier to be open and honest with an online treatment. Studies show that at least some participants do indeed feel this way about using technology in self-management (for example, Gerhards et al., 2011; Holst et al., 2017).

Lupton (2014a) explains how mobile apps are characterised by ease of access and mobility, which may present new opportunities for self-management using digital technology. However, these benefits should be balanced against criticisms that many phone applications for the management of depression, for example, have minimal evidence for their effectiveness and often contain poor quality information (Huguet et al., 2016).

Despite the challenges of the digital divide and the possible risk issues, the benefits and potential cost-saving of digital technology are likely to ensure that over the coming years it will play an increasing role in how healthcare is delivered, including mental healthcare. Given this, it is critical that we understand how to develop the technology in ways that facilitate user engagement and adherence.

1.9 Engagement with TBIs

Despite the evidence outlined above regarding the efficacy of TBIs in mental health, there is a need to know more about who these interventions are effective for, when they are effective, and why people might choose to engage or drop out from them (Renton et al., 2014). Additionally, the proportion of modules completed appears to be related to the effectiveness of online self-help for mental health problems (Donkin et al., 2011). In a study on attitudes towards computerised self-help a very low proportion of participants indicated they were likely to take up this treatment approach, and it was often perceived to be inferior to face-to-face therapies (Musiat, Goldstone, & Tarrier, 2014). It is absolutely crucial to understand user engagement with TBIs; they may be effective in research trials, and they may be a cost-effective treatment option, but this does not mean anything if people are not willing to use them! It is essential that attempts are made to understand the

challenges for user engagement, with the aim of identifying ways to overcome these challenges.

When people do take up TBIs, the drop-out rate can be a serious issue, with adherence potentially lower than 20% for self-guided TBIs (Karyotaki et al., 2015), and a review indicating an average drop-out rate of 57% across 40 studies (Richards & Richardson, 2012). Adherence might be a particular problem in real-world settings, as trials of TBIs are likely to recruit those already interested in mental health technologies (Mohr, Weingardt, Reddy, & Schueller, 2017). Studies of TBIs in real-life settings have found high drop-out rates of 38% (Cavanagh et al., 2006) and even 60-87% (de Graaf, Hollon, & Huibers, 2010). Furthermore, a trial of cCBT in primary care settings attributed the lack of effectiveness to low levels of engagement; 24% of participants had dropped out after four months, and less than 20% of participants completed all treatment modules (Gilbody et al., 2015).

Generally, the provision of support to provide a TBI is related to higher levels of adherence; a review found average drop-out rates for therapist-supported TBIs to be much lower (28%) than unsupported (74%) computerised interventions (Richards & Richardson, 2012). However, the participants in Gillbody et al.'s (2015) study received regular telephone support to use the TBI, meaning that the provision of support does not always guarantee high levels of adherence. Additionally, a study by Kenter, Warmerdam, Brouwer-Dudokdewit, Cuijpers, and van Straten (2013) regarding guided self-help for depression, anxiety, and burnout still suffered from high participant drop-out. There may be other factors that influence engagement, adherence and drop-out with TBIs, other than the presence of a supportive professional.

A review by Melville, Casey, and Kavanagh (2010) on drop-out in internet treatment for psychological issues found numerous variables associated with drop-out, including: contextual variables (e.g. presence of supportive social relationships); psychological variables (e.g. impulsivity); and treatment-related variables (e.g. treatment expectations, availability of a computer or internet access). Qualitative research on engagement with TBIs has also found a wide range of reasons that users drop out, such as: limited monitoring and follow-up to encourage adherence; the difficulties of logging on whilst unwell; overly complex and text-heavy content; and

inflexibility of treatment delivery (Johansson, Michel, Andersson, & Paxling, 2015; Knowles et al., 2015). TBIs may also negatively impact on a users' mental health; users of a TBI for depression reported that it could make them feel like a failure when having their difficulties reflected back at them by the program (Knowles et al., 2015).

It could be that insufficient user consultation during the design phase is partly to blame for issues around engagement, as the demand does exist (Birnbaum, Lewis, Rosen, & Ranney, 2015). As it has been found that TBI users may disengage from therapy if the content is not viewed as sufficiently personalised (Knowles et al., 2015), extensive involvement of users in TBI design may help to ensure that the topics covered are relevant to the target audience, and thus enhance engagement. By involving users from the very beginning, developers will have a better understanding of *how* people would prefer to use the intervention, as well as content that is more relevant to users' needs (Fleming et al., 2016). As Mohr et al. (2017) succinctly put it "mental health technologies must be designed for the people who will use them".

Clearly, there is an urgent need to understand more about the factors which influence the use of treatment delivered by technology (Solomon, Proudfoot, Clarke, & Christensen, 2015), and to understand the underlying mechanisms of change (Murray, 2012). Understanding mechanisms of change of an intervention is critical, as this concerns *how* an intervention comes to be effective or bring about therapeutic change (Kazdin, 2007). Ritterband, Thorndike, Cox, Kovatchev, and Gonder-Frederick (2009) propose several possible mechanisms of change in internet-delivered interventions, such as motivation, skill-building, and knowledge acquisition. Investigation into mechanisms of change in TBIs have found variables such as changes in perceived control and dysfunctional attitudes (Warmerdam, van Straten, Jongsma, Twisk, & Cuijpers, 2010) and emotion regulation (Ebert et al., 2016) to be mediating factors. One mechanism of change that has received limited attention in TBIs may be the therapeutic alliance.

1.10 The therapeutic alliance

Proposed characteristics of a strong therapeutic relationship between a client and therapist, include: empathy; respect; collaboration; motivation; fostering of hope; the provision of feedback; trust; reflection; and attempts to repair ruptures

where they occur (Cahill et al., 2008). The concept of the "therapeutic alliance" has a long history in psychotherapy research, with suggestions that the concept grew out of Freud's notions of transference (cited in Elvins & Green, 2008). Although there have been a variety of conceptualisations of the therapeutic alliance (Elvins & Green, 2008), arguably the most widely used model of the alliance is the theory of the "working alliance", which contains three key components (Bordin, 1979; 1994).

The first feature of Bordin's working alliance theory is "agreement on goals": the degree to which therapeutic goals have been agreed upon between therapist and client. The second component is "tasks": clients and therapists must collaborate during therapy – who is supposed to be doing what, in order to bring about therapeutic change? How do the therapeutic tasks help the client work towards their desired goals? The third component is "bonds", which centres around the quality of the interpersonal relationship between client and therapist. The "bond" aspect of alliance relates to the depth of trust, mutual liking, and attachment between the therapeutic dyad.

Hatcher and Barends (2006) make an effort to further clarify the concept of the therapeutic alliance, pointing out that at its essence, "alliance describes the degree to which the therapy dyad is engaged in collaborative, purposive work" (p.293). They also point out that alliance is an overarching, superordinate concept in psychotherapy, meaning that it is not simply a treatment technique. The alliance goes above this, and is an aspect of all parts of therapy. At this point, it should also be noted there has been a debate around the difference between the therapeutic *relationship* and the therapeutic *alliance,* and whether there are two separate concepts. This issue has been further confused by the use of the word "relationship" in the title of a popular measure of the therapeutic alliance (Agnew Relationship Measure; Agnew-Davies, Stiles, Hardy, Barkham, & Shapiro, 1998).

Hatcher and Barends (2006) have attempted to provide a conceptual distinction between the two, stating that the *alliance* and the *relationship* are not equivalent. They explain that Bordin's alliance theory is about considering the extent to which the relationship between therapist and client allow for collaborative and purposive therapeutic work (i.e. the therapeutic alliance). The *relationship,* rather, is a "vastly encompassing concept that includes any and all motivations and activities

of client and therapist, including hostility, seductiveness, humor, ingratiation, guilt, and so forth" (Hatcher & Barends, 2006, p. 298). So the *relationship* is comprised of any quality of the interpersonal relationship between client and therapist, but an *alliance* is the degree to which the dyad engage in collaborative, purposive therapeutic work. Any aspect of the wider *relationship* between therapist and client can be evaluated for the extent to which it contributes towards this collaborative and purposive *alliance* (Hatcher & Barends, 2006).

Bordin (1979) also proposed that alliance quality was the key reason behind the success (or not) of a change process. To examine this claim, there have been multiple meta-analyses on the association between therapeutic alliance quality and the outcomes of therapy. For example, Horvath and Symond's (1991) meta-analysis synthesised 24 studies, concluding a moderate and reliable association between working alliance and the outcomes of therapy. Martin, Garske, and Davis (2000) concluded in their meta-analysis of 58 studies that there was a moderate and consistent relationship between the two variables, covering patients with a range of clinical issues across the included studies. More recently, Horvath et al. (2011) conducted a meta-analysis which covered over 200 research reports, similarly finding a modest but consistent relationship between alliance and treatment outcome across heterogeneous treatment types.

In light of concerns that the alliance-outcome relationship found in research might arise as a result of other confounding variables, Flückiger, Del Re, Wampold, Symonds, and Horvath (2012) examined this possibility, finding that the alliance-outcome association remained after controlling for factors such as researcher interest in the alliance, and study design. Questions have also been raised about the direction of causality between alliance and symptoms – is it that alliance predicts symptomatic outcomes (as is commonly assumed - Zilcha-Mano, Dinger, McCarthy, & Barber, 2014), or do symptoms predict alliance levels? Zilcha-Mano et al. (2014) investigated this by modelling participants' changes over four time points, and concluded that alliance is the predictor, rather than the product of, symptomatic levels during therapy.

Goldsmith, Lewis, Dunn, and Bentall (2015) used instrumental variable modelling techniques to assess whether therapeutic alliance had a causal relationship

with the outcomes of early psychosis treatment. They concluded that improvements in therapeutic alliance *did* lead to improved symptomatic outcomes, and where participants had a poor alliance with their therapist, it was detrimental to attend further therapy sessions. Research by Fuentes et al. (2014) has taken an experimental approach to exploring the role of the therapeutic alliance in chronic lower back pain treatment. Participants received either an active or a sham treatment, and either received interactions from the therapist which were intended to enhance therapeutic alliance (enhanced alliance group) or no such interactions (limited alliance group). It was concluded that alliance was as influential for therapeutic outcomes as the treatment itself; particularly noteworthy was that the group receiving sham treatment and enhanced alliance demonstrated more positive change than the group receiving real treatment and a limited alliance (Fuentes et al., 2014). Taken together, these findings lend a degree of credibility to the hypothesis that therapeutic alliance has curative properties in itself, and suggests that at least, the therapeutic alliance facilitates the effectiveness of therapeutic techniques.

Additionally, the alliance concept was considered applicable to all "change" situations, not just psychotherapy (Bordin 1979), and the therapeutic alliance has since been studied in situations which go beyond the typical face-to-face, individual psychotherapy encounter. A good example is given by a systematic review which made tentative conclusions that a therapeutic alliance can be established in e-therapy, and this alliance is associated with treatment outcomes (Sucala et al., 2012). In a narrative review about therapeutic alliance in internet-delivered interventions, Berger (2017) similarly concluded that a therapeutic alliance can be formed across various different technological formats between a therapist and a client.

1.11 The therapeutic alliance in TBIs

Interestingly, in his original paper, Bordin (1979) notes that the concept of the working alliance is relevant for all "change situations" (p.252), and the working alliance is described as being between a "person seeking change and a change agent" (p.252). Since the use of a TBI could reasonably be conceptualised as a change process, could the therapeutic alliance concept retain validity here? Does the TBI count as being a "change agent", to use Bordin's words? Or since there is less role for a human therapist, does the concept of a therapeutic alliance no longer apply? In

forms of therapy which use digital technology but still have communication with a human therapist at their heart (i.e. "e-therapy" as described above; Manhal-Baugus, 2001), it is not entirely surprising that a therapeutic alliance can be established online despite physical distance between a client and their therapist. What is unclear, however, is whether an alliance can be conveyed by a piece of *digital technology itself*, such as a website, computer program or smartphone app – a technology-based intervention. As TBIs deliver treatment usually by text, narration, and/or interactive tasks, rather than by a human therapist, can a therapeutic alliance be established between a user and a TBI?

Therapists' concerns regarding the therapeutic relationship in TBIs have been well-documented. For example, Stallard et al. (2010) surveyed mental health professionals about their views on cCBT for children and adolescents. The perceived absence of a therapeutic relationship was one of their participants' biggest apprehensions over cCBT, as they often felt that insufficient support would be available to service users. Other studies have supported these findings, demonstrating that therapists are concerned about limitations on the opportunity to develop a therapeutic relationship in cCBT (MacLeod et al., 2009; Newton & Sundin, 2016).

There are many unanswered questions about the role of the therapeutic alliance in the context of TBIs. This thesis mainly concentrates on one overarching question: does the concept of the therapeutic alliance remain valid when it is applied to the *digital technology* of a TBI, rather than a human therapist? Can a user of a TBI experience a therapeutic alliance with a computer program that is used on a self-guided basis? Much previous research on TBIs has focused on effectiveness, with limited research on the underlying change processes or mechanisms of action (Cavanagh & Millings, 2013). This thesis will be a valuable contribution to the TBI literature, by exploring the therapeutic alliance process in this medium.

There have been recommendations that to be more effective at replicating the traditional therapeutic encounter, TBIs such as computerised therapy must try harder to include features which resemble a therapeutic relationship, such as the communication of empathy and providing the user with motivation (Proudfoot, 2004). Barazzone, Cavanagh, and Richards (2012) examined the content of three

widely-used cCBT programs, to investigate the extent to which they incorporated key features for the establishment, development, and maintenance of a therapeutic alliance between the user and the program. The features of alliance that were investigated were based on an adaptation of Cahill et al.'s (2008) model of therapist-client interactions for self-help materials (Richardson, Richards, & Barkham, 2010). They concluded that the programs exhibited substantial evidence of these alliance features, including: empathy and acceptance, and the negotiation of goals (part of "establishing the relationship"); providing feedback and building confidence in the program's effectiveness (part of "developing the relationship"); and rupture prevention and repair by encouraging users to return to the program after a break (part of "maintaining the relationship").

Some researchers have deliberately attempted to create working alliance processes in the design of their interventions. Holter et al. (2016) describe their attempts to do so in a fully-automated online smoking cessation intervention, that simulates a working alliance by allowing users to negotiate goals with the program, and by the use of a conversational agent that uses "human" strategies such as empathy and humour. In theory, it appears plausible that a TBI might be able to employ adequate strategies to build a therapeutic alliance with its user.

By studying therapeutic alliance processes in TBIs, we might be able to gain a greater understanding of what can help people to engage with TBIs, which is crucial given the generally low levels of adherence to these forms of treatment. It is possible that digital technologies which allow the user to set relevant goals, appear trustworthy and empathetic, and offer users appropriate therapeutic tasks may demonstrate greater levels of engagement than those which do not. Although the factors related to engagement with TBIs are wide-ranging and numerous (Melville et al., 2010), inclusion of therapeutic alliance features may help to somewhat mitigate against drop-out.

1.12 The present thesis

This thesis aims to shed light on the answer to the following question: what is the nature of the therapeutic alliance in the context of digital technology-based interventions (TBIs) for mental health problems? This thesis is constructed in the alternative format, with the chapter content as follows: a methodology chapter

detailing methodological decisions made; two chapters in the form of journal-style papers; a discussion chapter explaining the conclusions of the thesis in context. Both journal-style papers will be submitted for publication in the Journal of Medical Internet Research. The first journal-style paper is a systematic review of the literature published to date that has examined a relationship between the user and a TBI. The research questions to be answered by the systematic review are as follows:

- To identify the terms and concepts used regarding the relationship between human and technology in the context of TBIs for mental health problems.
- To ascertain whether the working alliance model of the therapeutic alliance remains valid in a TBI context.
- To provide an understanding of the factors which influence the human-technology relationship.
- To identify the measures used to assess the human-technology relationship within TBIs.
- To review research regarding the ability of the human-technology relationship to predict the outcomes of TBIs for mental health problems

The second journal-style paper of the thesis concerns TBI users' experiences of using this type of treatment, and will employ qualitative methods to answer the following research questions:

- What are users' experiences of using TBIs for their mental health?
- Which features of TBIs can promote user interaction and engagement with the TBI?
- Do users of TBIs experience a therapeutic alliance with the technology?
- How is this "alliance" viewed and referred to?
- Which factors influence the alliance in TBIs?

1.13 Writing style

Before continuing with the thesis, I would like to explain its writing style. As the primary investigator and thesis author, I am generally writing it in the first person for the sake of consistency and clatrity. Whilst there was a supervisory and wider team involved in all key research decisions (see authorship statement for details), I take ultimate responsibility for methodological and analytical decisions made, and

Where necessary, the specific contributions and discussions had with members of the team are detailed in subsequent chapters.

Methodology

`   This chapter will give an in-depth account of the underpinning assumptions and positioning of the thesis, the methodology chosen, and the rationale behind these choices. I will address the methodology of the systematic review chapter, the qualitative interview chapter, and an explanation of how the methods complement each other. As a reminder, the key aim of this thesis was to explore the nature of the therapeutic alliance as it applies to the relationship between a human user and a technology-based intervention (TBI) for mental health problems, and to ask whether it was possible to engineer a TBI to contain elements of a therapeutic alliance.

The core aim of the systematic review was to provide an understanding of the nature of the human-technology relationship in the context of TBIs for mental health problems, and specifically to explore the validity of therapeutic alliance theories in TBIs. To this, I utilised a best-fit framework synthesis approach (Carroll, Booth, & Cooper, 2011) to analysing relevant qualitative, quantitative, and mixed methods data. The review also aimed to examine how the human-technology relationship in TBIs was measured, and the association between the human-technology relationship and TBI outcomes. In this chapter, I will outline the rationale for the choice of this approach and explain key decisions made throughout the process.

The purpose of the qualitative interview study was to investigate users' interaction and engagement with TBIs, and whether the therapeutic alliance remains a valid and useful concept within this treatment context. To do this, I used topic-guided interviews to collect qualitative data about participants' engagement with TBIs for mental health problems, which were analysed using thematic analysis.

2.1 Underpinning assumptions

This section explains the underlying assumptions of this thesis. This is so readers can understand the ontological, epistemological, and contextual positions which have guided the methodology. It is important to be aware that no single position provides a fully accurate picture of a social phenomenon, and as such, we should approach theory from the perspective of believing, but also doubting (Elbow, 1986). In this spirit, I will explain the strengths of this approach (the "believing perspective") as well as the possible limitations and alternative approaches (the "doubting perspective").

2.1.1 Ontology and epistemology

Social sciences research is guided by underlying philosophical assumptions based on the nature of social phenomena (ontology) and how this word can be known (epistemology; Blaikie, 2007). At one end of the ontology spectrum is the position that the social world exists independently of social actors, and at the other is the view that social phenomena are the product of social interaction (Bryman, 2016). Epistemology asks how social reality can be known, or what constitutes acceptable knowledge (Bryman, 2016).

Ontological and epistemological assumptions are intimately connected, as statements about the nature of social phenomena have implications for how knowledge can be gained of these social phenomena, and the appropriate research methods used (Blaikie, 2007; Bryman, 2016). The assumptions also provide a particular framework through which reality is viewed (Silverman, 2015), and influences the conclusions which can be drawn from research (Moisander & Valtonen, 2006). It is therefore crucial that a researcher states the positions taken, given these implications for the type of knowledge which is produced.

One ontological stance is "realism", which posits that external reality exists separately to our descriptions of it (Blaikie, 2007; Bryman, 2016). Within realism, phenomena in both the natural and social world have an existence which is independent from social actors, and social science aims to discover regularities and laws in the social world (Blaikie, 2007). When it is believed that the terms used to describe reality correspond very closely to reality's true nature, this position is often referred to as "naïve", "empirical", or "shallow" realism (Blaikie, 2007; Bryman, 2016). According to this version of realism, it is possible to accurately know reality, given the right methods are employed (Bryman, 2016).

However, "realism" refers to a wide range of views (Pernecky, 2016), and many realist researchers do not subscribe to the more extreme claims made by "naïve" realism. Critical realism is member of the realist family, which has grown from the work of Roy Bhaskar (for example, Bhaskar 1979; 1989). Ontologically, critical realism asserts that a real world *does* exist independently of our beliefs, but also takes a constructionist epistemological position by stating that this real world cannot objectively be known (Maxwell, 2012; Pernecky, 2016; Guba, 1990). A

constructionist epistemology involves recognising that meanings are constructed and influenced by context, and that researchers and participants construct meaning together (Blaikie, 2007; Silverman, 2015). This contrasts with the positivist approach sometimes associated with naïve realism, due to positivism's focus on collecting data in a value-free, objective manner to arrive at an accurate picture of the truth (Silverman, 2015). However, critical realism also rejects the assertions of some constructionist approaches that there are multiple socially constructed realities, and instead posits the existence of "different valid perspectives on reality" (Maxwell, 2012, p.9)

Additionally, limitations in the human senses and the nature of observing as interpretive (Blaikie, 2007) means that knowledge of social reality cannot be certain and will always be flawed (Scott, 2007). Critical realism accepts that there are differences between the social world as it actually exists, and the terms used to label this reality (Bryman, 2016). The nature of knowledge as theory-laden is accepted (Maxwell, 2012); the theories and interpretations produced by different researchers will vary, but they all attach in some way to reality.

Relatedly, there is space within critical realism to include theoretical terms in explanations of social reality, which further contrasts with positivist and empiricist approaches in which only observations via the senses constitute legitimate scientific knowledge (Bryman, 2016; Pernecky, 2016). Bhaskar (1989) refers to "generative mechanisms", which are theoretical explanations for observed regularities in the natural or social world. These mechanisms are of key importance, as critical realists attempt to develop explanations for observed associations between phenomena (Maxwell, 2012). The appreciation of context is also relevant to the centrality of generative mechanisms, as contextual factors influence generative mechanisms (Bryman, 2016). Additionally, critical realism regards mental phenomena as equally real to physical phenomena, as mental states influence social actors' actions and worlds (Maxwell, 2012). To obtain the richest explanation of social reality, critical realism considers social actors' inner states, context, and the possible generative mechanisms producing an observed regularity (Bryman, 2016; Scott, 2007).

The critical realist approach is also sometimes associated with a falsificationist epistemology (Blaikie, 2007). Falsificationism is associated with the

"hypothetico-deductive method" which advocates the collection of data in an attempt to refute a particular theory (Popper in Blaikie, 2007). Theories "passing" this test can be tentatively accepted; as with critical realism, theories are proposed as a way of explaining observations, but this knowledge can never be truly certain. The role of theory in the present thesis is outlined in further detail below (see Section 2.1.2).

Having outlined the core principles of critical realism, I would like to now explain why I deemed this to be an appropriate epistemological and ontological choice for the present thesis. With team discussion, I felt that there was an interaction of *some kind* occurring between TBIs users and the TBIs themselves, existing as part of social reality. Consequently, I take the realist ontological component of critical realism, and aim to explore the nature of this interaction with this thesis.

As described above, critical realism accepts the use of theoretical terminology in referring to social reality (Maxwell, 2012). In the present thesis, I am examining the interaction between users and TBIs through the theoretical lens of therapeutic alliance. Therapeutic alliance theory was chosen due to the decades of previous research conducted on the concept in the context of face-to-face therapy (see Sections 1.10 and 1.11). In brief (full details provided in subsequent sections if this chapter), the systematic review synthesised data on the user-TBI interaction using a framework built from concepts central to therapeutic alliance theories. Many of the questions in the qualitative interviews also concerned these concepts, and participants' accounts were interpreted in light of them.

I accept that I can only know reality via my own interpretations and terms I use to describe it, which is limited in its correspondence with *actual* social reality. Thus, I accept that I am attaching theoretical concepts to the data synthesised in the systematic review and the accounts given by qualitative interview participants regarding their reality. This is in keeping with critical realism, but would have been unacceptable had I taken an empiricist approach, as theoretical entities such as the "therapeutic alliance" are not directly observable.

The presence of generative mechanisms in critical realism is also relevant to my thesis' aims, because therapeutic alliance has been suggested as a causal explanation for the success level of face-to-face psychotherapy. As critical realism is

concerned with creating explanations for observed phenomena (Bryman, 2016; Maxwell, 2012), exploring therapeutic alliance as a possible mechanism that influences user engagement with TBIs is philosophically consistent with critical realism.

Lastly, I also feel it is necessary to outline why critical realism was felt to be appropriate for the qualitative interview study. Indeed, Maxwell (2012) has specifically written a book to advocate the value of realist approaches for qualitative research, as this is an uncommonly stated position within qualitative research (Maxwell, 2012). As critical realism provides a position from which is it possible to examine the relationships between social actors' perspectives, situations and contexts, it can be a useful approach to qualitative research (Maxwell, 2012). With examples from the the present project, this means I could examine how the context in which someone accesses a TBI influenced their interpretations, or consider how my interview questions influenced their account. As realist positions can be useful within qualitative research for exploring causal explanations (Pernecky, 2016), it is an appropriate position for exploring some of the interview study's research questions (for example – "which factors influence the alliance in TBIs?").

As ontological and epistemological assumptions influence the kind of research questions asked and knowledge obtained, I should note that alternative positions could have been chosen, which would have altered the kind of knowledge produced by this thesis. One such alternative approach is "interpretivism", which rejects the notion that natural science principles can be used in social science, as the social world is completely different to the natural world (Bryman, 2016). The focus of an interpretivist piece of research involves understanding the subjective meaning and interpretations that people attach to their world, rather than examining external "forces" acting upon it (Bryman, 2008). Interpretivism is typically associated with the use of qualitative methods (Maxwell, 2012).

An example of an interpretivist approach is phenomenology, which seeks to understand, in detail, how an individual makes sense of their surrounding world and experiences (Bryman, 2016). A phenomenological method known as interpretative phenomenological analysis (IPA) emphasises the detailed exploration of an individual's perception and experiences (Smith & Osborn, 2015). IPA does not aim

to make general claims; rather, it focuses on the perceptions of a particular group in great detail, and therefore often aims for a relatively homogenous sample (Smith & Osborn, 2015). Using IPA in this study, I would have been able to draw conclusions about the detailed experiences of a small group of TBI users. As my research aims are concerned with common engagement and therapeutic alliance features present across the experiences of people representing a range of clinical groups and TBI formats, it does not appear that IPA would have been an appropriate approach for this study.

Indeed, taking an interpretivist approach to this thesis would produce would alter the claims I can make regarding therapeutic alliance and TBIs. This is because an interpretivist approach focuses on the subjective meanings social actors hold with regard to their experiences, and does not seek to make claims regarding an external reality. With an interpretivist approach, I would be able to make claims regarding TBI users' interpretations of their experiences using a TBI, but unable to make claims about an external reality pertaining to those beyond my participant group. As such, I did not opt for an interpretivist approach, as I wanted the ability to make wider suggestions about people's interactions with TBIs beyond the perspectives of those I interviewed, or data from the papers included in the systematic review, and ultimately influence TBI development.

With an interpretivist position such as phenomenology, it would also be inappropriate to examine a previously outlined theory (in this case, therapeutic alliance theory), as this would unduly constrain participants' responses in this approach. Whilst an interpretivist approach aims to understand participants' perspectives, a realist approach aims for explanation and causality (Pernecky, 2016). Given the aims of the project included answering causal questions, a cautious reality approach was deemed to be more appropriate.

To summarise, the philosophical position I have taken with regard to this thesis is critical realist. Ontologically, I am asserting that an external social reality does exist, and epistemologically, I am asserting that the way this reality can be known is mediated by our interpretations. I acknowledge a degree of constructionism in my position, as I will inevitably influence the way in which the account of reality is constructed in both the systematic review and qualitative interview study.

It is also worth nothing here that research methods are much more "'free-floating'" in terms of epistemology and ontology than is often supposed" (Bryman, 2008 – p.593). To illustrate, although qualitative research is typically associated with constructionism and interpretivism, and quantitative research with objectivism and positivism, this is not always the case (Bryman, 2016). Although certain philosophical approaches are often associated with particular methods, these should be viewed as tendencies rather than absolute commitments (Bryman, 2016). This is relevant, due to my project's apparent deviations from this usual divide (i.e. use of a realist approach within qualitative research).

2.1.2 Role of theory

Another consideration concerns the role of theory in the research process, and whether a researcher is collecting data to build a theory from scratch, or to put an existing theory to the test (Bryman, 2016). Theory plays a crucial part in research, due to their use as frameworks to understand social phenomena and interpret research findings (Bryman, 2016). Two common ways to approach the use of theory in research are via inductive or deductive reasoning (Bryman, 2008).

When using an inductive approach, the researcher begins with their observations and data collection, and then seeks to identify patterns within their data to develop theories and associated generalisable inferences (Blaikie, 2009). An inductive research strategy is typically associated with qualitative research (Bryman, 2016). A deductive approach begins with an already-established pattern of occurrences, from which theoretical expectations and hypotheses are derived (Blaikie, 2007). These are then tested by the collection of appropriate data (Bryman, 2016). The overall aim of a deductive research strategy is to determine whether a theory is supported by the data, and to eliminate incorrect theories (Blaikie, 2009).

In real-life research scenarios, the deductive process is not as linear as outlined here, and often involves moving back-and-forth between theory, data collection, theory modification and further data collection (Bryman, 2016). The deductive approach is typically associated with quantitative research (Bryman, 2008), and with the critical realist and falsificationist positions (Blaikie, 2009). Similarly, inductive reasoning is often used within qualitative research, but some qualitative research involves the use of theory as a background, or testing previously

outlined theories using qualitative methods (Silverman, 1993). As with the epistemological and ontological positions discussed above, inductive and deductive approaches should also be considered as tendencies, rather than as having exclusive ties to qualitative and quantitative methods respectively (Bryman, 2008).

I will now outline how induction and deduction relate to my thesis. I was interested in whether a TBI for mental health problems can be engineered to contain elements of a "therapeutic alliance", and thus I am examining some previously-specified theoretical concepts (see Section 1.10 for an overview of therapeutic alliance theory). Therapeutic alliance theory has received a large degree of attention in face-to-face therapy research, and the rationale for this thesis was to examine whether this therapeutic process also features in treatment approaches with a limited role for human therapists. On the basis of this prior research, an assumption has been made that an interaction, or alliance, of *some sort* is happening when someone uses a TBI.

Hence, it could be argued that I am "testing" therapeutic alliance theory, as I am examining its applicability to a different therapeutic context (i.e. TBIs) to that in which it was developed in (i.e. face-to-face therapy). Epistemologically, this demonstrates a falsificationist approach to theory testing, which is connected to critical realism as described above. My thesis can generally be considered to have a deductive orientation, due to the influence of existing research and theory on the study designs.

Note that detailed, specific examples of the influence of therapeutic alliance theory on the methods of the systematic review and qualitative interview study will be referenced throughout the following sections of this chapter, and are outlined only briefly here for illustration. With regard to the systematic review, therapeutic alliance theory influenced the framework applied to analyse the data relevant for answering the research objectives; for instance, by extracting data pertinent to previously-identified alliance components (see Section 2.2.6 below for full details). Therapeutic alliance theory also influenced the conduct of the qualitative interview study in several ways. For example, participants were asked questions about alliance-relevant dimensions (such as the ability to set goals with the program). As

such, the applicability of therapeutic alliance theory to TBI users' experiences was being "tested", representing a deductive approach.

Existing theories are particularly useful when exploring unknown areas, as they provide a framework which aids the understanding and interpretation of phenomena (Silverman, 2015). Examining an existing theory was felt to be valuable in the new context of TBIs, since little is known about the underlying processes of users' interactions with TBIs, and therapeutic alliance theory provided something to "hang" the data on.

In qualitative research, data collection is usually somewhat unstructured, allowing for a more inductive and flexible approach (Bryman, 2008). By using a "structured" approach in the review (by the use of best-fit framework synthesis; see Section 2.2.6) and qualitative interviews (with a substantial number of theoretically-driven topic guide questions), it can be said that as a researcher I have conducted this project with certain expectations about what I will find within social reality (Bryman, 2008). Subsequently, it could be argued that the theory-driven way in which I have chosen to examine people's interactions with TBIs will limit the conclusions which can be drawn. Since I am actively seeking evidence of therapeutic alliance dimensions, it is perhaps unsurprising if it is found, and I may miss other important aspects of the TBI interaction experience which are not alliance-relevant.

If, however, I had opted for a more inductive approach, it is likely I would draw different conclusions from this data, because the more unstructured data collection in qualitative research is often considered to allow more flexibility during a project (Bryman, 2008). With less focus on therapeutic alliance theory dimensions in both projects, I could be more likely to identify salient aspects of TBI usage which do not map onto alliance elements. However, there was also an inductive role for theory in my research somewhat, as the methodology used in both papers allow for new themes to be identified, and revisions to theory made. There was some inductive "building" of theory, or at least adding to existing theory, in my thesis. This is not uncommon; the last step of research often involves a move towards induction via the revision of theory (Bryman, 2016).

2.2 Systematic review: methodology

2.2.1 Choice of systematic review methodology

There was a compelling need to gain an understanding of the current state of knowledge regarding the therapeutic alliance as it relates to TBIs. Although this research area is in its early stages, I was aware of several papers that had investigated the role of the user-technology therapeutic alliance. However, it was felt necessary to do a full systematic review to gain a clear picture of the field at present, and also to inform the qualitative interview paper. Doing a high quality, sophisticated literature review is a crucial part of a student dissertation, as it provides students with a fuller understanding of the previous research and helps to frame your own work in relation to it (Boote & Beile, 2005). Having a strong understanding of the context of the field also clarifies the potential contribution of new research to the knowledge base (Hart, 1998).

A systematic review is defined as a review that "attempts to collate all empirical evidence that fits pre-specified eligibility criteria to answer a specific research question" (Liberati et al., 2009, p. 2). The systematic review is viewed as a crucial method for working towards evidence-based medicine; that is, basing clinical decisions on the best available evidence (Sackett & Rosenberg, 1995). As a result of increased interest in evidence-based medicine, there are a growing number of systematic reviews being published (van Tulder, Furlan, Bombardier, Bouter, & Editorial Board of the Cochrane Collaboration Back Review, 2003). The applications of a systematic review are wide ranging, as their results can be used by clinicians to update practice, and by policy makers to understand the possible risks and benefits of a health intervention (Liberati et al., 2009). As there is an overwhelming volume of health information available, the use of systematic reviews to synthesise evidence is incredibly helpful for clinicians and practitioners who are under substantial time pressure (Cook, Mulrow, & Haynes, 1997; Mulrow, 1994).

The Cochrane Collaboration have produced an extensive, detailed handbook which supports researchers to conduct high-quality systematic reviews of healthcare interventions, including guidance on the following core steps: defining a review question and inclusion/exclusion criteria for the studies; search strategies to locate research; applying the inclusion/exclusion criteria and collecting relevant data;

assessing the included studies for bias; and data analysis and interpretation (Higgins & Green, 2011). Similar guidance has also been produced by the Centre for Reviews and Dissemination (2008), which can be used as a step-by-step methodological guide for researchers planning a systematic review. Whilst many systematic reviews focus on the effectiveness of an intervention, their aims are not limited to questions of effectiveness. Systematic reviews may also focus on economic evaluations, the prognosis of a health condition, or the association between risk factors and outcomes (Petticrew & Roberts, 2008).

One reason for choosing systematic review methodology was the emphasis on a comprehensive and broad search strategy to locate literature appropriate for answering the research question (Centre for Reviews and Dissemination, 2008). Undertaking a comprehensive search strategy was felt to be the best method for locating the available literature on TBIs and the therapeutic alliance. Interventions meeting this thesis' inclusion criteria ("technology-based interventions") have been referred to using a wide range of terms, and are delivered by many different digital technologies. Therefore, the main search strategy involved using an expansive set of search terms that could capture these heterogeneous TBIs, across multiple electronic databases (see Appendix A for full search terms and strategies). Using this search strategy was an effective method for maximising the chances of identifying all relevant literature to the research questions.

The systematic review process involves substantial time and effort on part of the reviewers, and may involve the screening of thousands of records (Petticrew & Roberts, 2008). Whilst the resources involved in conducting a systematic review *are* significant, the reduced risk of missing crucial research was viewed as enough of an advantage to offset the necessary effort. Identifying all the studies which could help to answer the research question will ultimately further our understanding of the therapeutic alliance as it applies to TBIs.

However, systematic reviews are about more than being comprehensive (Petticrew & Roberts, 2008). The second reason for selecting systematic review methodology was the emphasis on rigour, transparency, and explicit procedures (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). For example, the use of a thorough search also has the benefit of reducing the risk of bias inherent in the

review (Centre for Reviews and Dissemination, 2008). Transparency in the process is hugely important, as readers of the review can evaluate the methods used and can even attempt to reproduce the results of the systematic review (Centre for Reviews and Dissemination, 2008; Mulrow, 1994). An awareness of the possible limitations of the review helps readers to interpret the findings in light of these; a comprehensive and transparent report of the review's methods allows for conclusions to be drawn about the reliability of the findings (Centre for Reviews and Dissemination, 2008; Moher, Simera, Schulz, Hoey, & Altman, 2008). By fully documenting how the team conducted the search, study selection, data extraction, quality appraisal and analysis of this review, readers will be better positioned to understand the conclusions that were reached about to the therapeutic alliance in TBIs.

Ultimately, a systematic review will provide an understanding of the current state of alliance research in TBIs. Not only can this knowledge be used to support the planning of future research, it could be used by TBI developers to create products that are better able to engage and build a therapeutic alliance with users.

2.2.2 Inclusion criteria

In systematic reviews, selection criteria for the studies are outlined in advance and applied consistently across the search results, to reduce the risk of selection bias when deciding to include studies into the review (Centre for Reviews and Dissemination, 2008; Higgins & Deeks, 2011). The rationale behind each inclusion criterion is outlined below.

2.2.2.1 Study designs

Whilst deciding on the review's inclusion criteria, the study designs that would be appropriate for answering the research questions were considered. Qualitative research is often excluded from systematic reviews; however, qualitative research has strengths in its ability to examine peoples' attitudes and perspectives, and can provide answers to questions that quantitative experimental methods are not well-placed to answer (Green & Britten, 1998). As the systematic review aimed to explore the nature of the human-technology relationship and factors that influence this relationship, it was felt that the rich data provided by qualitative research would be valuable for answering these research questions. As I was also interested in how

the therapeutic relationship has been measured in TBIs, as well as the association between the human-technology relationship and TBI outcomes, the research team decided that papers utilising quantitative research designs would also be included. However, the inclusion of diverse study designs did present some added challenges to undertaking this systematic review.

Dixon-Woods et al. (2006) provide an overview of the systematic review methodology's history; as the method developed from the shift towards evidence-based medicine, systematic reviews have typically focused on effectiveness and whether something "works". As a result, study designs outside of the RCT were usually excluded (Dixon-Woods et al., 2006). However, review authors should reflect upon the unique value and insight that qualitative research could bring to answering their research questions. Qualitative studies can provide rich detail about a phenomenon, as well as unexpected insights into a topic that could not have been predicted or would not have been captured using quantitative methods such as questionnaires (Pope & Mays, 1995). Furthermore, the inclusion of qualitative research in synthesising literature can be useful for explaining the mechanism of action in interventions (Booth, 2016) – why does a certain intervention work, or not? Since the establishment of a therapeutic alliance is a prospective underlying mechanism of action in TBIs, the inclusion of qualitative research was an appropriate methodological decision.

The inclusion of qualitative research was also strongly based on the desire to build upon therapeutic alliance theory. As explained in the introductory chapter in more detail, the therapeutic alliance with regard to the interaction *between a human user and a piece of technology* is a relatively new but expanding area of inquiry. Because this is an emerging field, it was felt that including qualitative research could be extremely useful for understanding more about how therapeutic alliance is *experienced* by users of TBIs. The applicability of therapeutic alliance theories has not been firmly ascertained to a TBI context, and qualitative findings (for example, detailed first-hand accounts of user-TBI interactions) might also help to answer this core research question. Quantitative research investigating the user-TBI alliance has made use of existing therapeutic alliance measures adapted for a TBI context (for example, Kiluk et al., 2014); whilst participants' scores on these measures are informative, they do not contain the detailed richness of a qualitative account of a

user-TBI interaction. The dimensions of therapeutic alliance may differ in a TBI context, and the items of questionnaires adapted from a face-to-face context may not entirely capture these (Clarke et al., 2016). Qualitative research may reveal the alliance dimensions that are unique to TBIs, and currently not captured by existing alliance measures.

However, it was anticipated that including qualitative research would present a challenge to the manageability of the review, as the difficulties in searching for qualitative research have been documented. For example, limitations have been identified in the way that qualitative research is indexed in electronic databases, as not all databases are using index terms which accurately refer to the qualitative research design used (Booth, 2016; Dixon-Woods et al., 2006; Evans, 2002). The issues are not limited to index terms; titles of qualitative research papers are often descriptive and exclude key search terms, which can make them harder to locate or screen for eligibility (Evans, 2002; Flemming & Briggs, 2007; Jones, 2004). There have also been suggestions that the information provided in qualitative papers' abstracts can be of poor quality, meaning that researchers might not realise a record is relevant, or a paper might lack an abstract altogether (Dixon-Woods et al., 2006; Evans, 2002). The impact of qualitative studies on healthcare will be limited if they cannot easily be located.

Conducting searches specifically with the aim of retrieving qualitative research can be slow and labour-intensive, and often does not follow the same step-by-step procedure of searching databases for quantitative literature (Booth, 2016; Dixon-Woods et al., 2006). As searches for qualitative literature can yield large amounts of irrelevant results, there is a need to balance sensitivity (to what extent all relevant records are picked up by search terms) and specificity (how many of the search results are relevant) when searching for qualitative research (Booth, 2016; DeJean, Giacomini, Simeonov, & Smith, 2016).

Several authors have explored methods for identifying qualitative research for literature reviews. Finfgeld-Connett and Johnson (2013) explain the advantages of taking a "berry-picking" approach: reviewers should start with a good study for their research question, and scrutinise it for possible links to other related sources (for example, scanning reference lists, citation tracking, looking up further work by

its authors). This yields more "edible berries" (p.7), and so the process continues iteratively. The importance of transparency is staunchly emphasised, and the path that this procedure takes reviewers on should be documented (Finfgeld-Connett & Johnson, 2013). In this review, I did use some "berry picking" strategies (citation tracking and reference list screening) to avoid sole reliance on electronic database searches. As this was an MPhil student project conducted under time pressure, it was regrettably not possible to plan any further search strategies to locate qualitative research, such as contacting study authors for further data or hand-searching journals that publish qualitative health research.

Please note that the "best fit framework synthesis" section below provides an in-depth consideration of the effect of including diverse study designs onto the analysis strategy.

2.2.2.2 Participants

The participant groups eligible for inclusion into the review were those that used a TBI to improve their mental health. There was no age limit, and participants were not required to have a diagnosis of any specified condition. This was for two reasons. Firstly, as therapeutic alliance is proposed to be a concept that applies across therapeutic change situations (Bordin, 1979), it was expected that if therapeutic alliance remains relevant to TBIs, it would be relevant regardless of participant diagnoses. Secondly, as therapeutic alliance in TBIs is a relatively new field, all data from participants experiencing mental health issues was expected to be valuable for answering the research questions, without limiting participants to those with a specific diagnosis or those with formally diagnosed mental health conditions.

Participants that used a TBI *only* for something other than a mental health condition (for example a physical health issue, neurological disorders, or developmental disorders) were not eligible for inclusion. If, for example, a TBI was targeted at managing a physical health issue *and* a mental health issue, this would have been included. Studies which had any groups other than mental health service users (for example therapists, clinicians, or patients' relatives) as the only providers of relevant data were also excluded. This criterion was decided upon following discussion with the research team, because we wished to understand therapeutic alliance experiences directly from those using TBIs. Similarly, studies were not

included which analysed the content of TBIs, rather than obtaining data directly from users. Whilst fascinating studies have been published that take this approach to investigating the therapeutic alliance in TBIs (for example, Barazzone et al., 2012), I was interested in the perspectives of those that have used TBIs, and therefore only included studies with data provided by TBI users.

2.2.2.3 Interventions

The intervention criteria were largely based on Barak et al.'s (2009) definition of web-based interventions (outlined in introductory chapter, and re-stated later in the systematic review). Due to the vast range of ways that digital technology has been used in mental health (Barak & Grohol, 2011), locating and screening papers according to these criteria was particularly difficult. Moreover, the variety in terminology that has been used to refer to the applications of digital technology in health has been highlighted (Ritterband & Tate, 2009). It was not always straightforward to identify whether a record met the inclusion criteria on the basis of the title or abstract, due to the often-limited details provided about the TBI's format and content. Although the role of a second reviewer in screening is expanded upon below, it should be noted that this was enormously useful in sorting through the sometimes ambiguous descriptions of TBIs, and helping to ensure that relevant records were not missed.

A key part of the intervention criteria used in this systematic review was that the TBI was either entirely or mostly used on a self-guided basis. The decision to focus on these TBIs was made due to a specific interest in the relationship between the human user and the digital technology of the TBI. I felt that users' experience of a therapeutic alliance with a TBI would be significantly influenced by the presence of substantial human support. In order to give detailed consideration to the user-technology relationship, we therefore decided as a team to focus on TBIs that were delivered with low contact. However, it has been suggested that there is a triangular alliance between the user, TBI, and supporting clinician (Cavanagh, 2010). Although the present systematic review does not examine this, or include alliance data from therapist participants, this is certainly an interesting avenue for further research.

2.2.2.4 Relevance to human-technology relationship

The paper must contain data which was relevant to the therapeutic alliance, therapeutic relationship, or human-computer interaction between a TBI and its user. A paper was included if it contained a measure of therapeutic alliance or relationship, which was applied to a person's relationship with the digital technology (i.e. excluded if the measure was applied to a human therapist). Alternatively, a paper was included if somewhere in the method, results, or discussion section, there was a stated relevance to the therapeutic alliance, therapeutic relationship, or human-computer interaction.

These criteria were set to establish relevance of the data for answering the research questions of the systematic review, which was centred around the nature of the human-technology relationship in TBIs. The search terms also reflected this, as there was a group of terms intended to capture papers that studied the therapeutic alliance, relationship, or human-computer interaction. One of these terms had to appear in the article's full text in order for the record to be retrieved during the database searches. However, these search terms and criteria did not extend to some other specific dimensions which have been hypothesised to form part of a therapeutic relationship, such as empathy and trust (Cahill et al., 2008). There have been numerous studies on users' experiences of TBIs (for example, Johansson et al., 2015; Knowles et al., 2015); it is likely that their themes could have been looked at through an alliance lens, and contributed to the theory development of this review. However, if a term such as "therapeutic alliance" was not used by the study authors, the record would not have been located. Although these decisions were made to maintain the manageability and tighten the focus of the review, it is acknowledged that some potentially relevant literature may not have been included.

2.2.3 Update searches

The policy outlined by the Cochrane Collaboration is to update a systematic review every two years, which must include a new search for literature (Higgins, Green, et al., 2011). As approximately 18 months passed between the initial literature searches and a full write-up of the review, the search strategy was re-run. However, by the time this review is published, it is likely that there will be even more relevant papers published in the meantime (Pautasso, 2013). Due to the

expanding interest in mechanisms of change and the therapeutic alliance in TBIs, it is likely that this review will need to be updated again in the near future.

2.2.4 Quality assessment

Decisions about how I would approach the issue of quality assessment of the papers were difficult, due to the complexity of appraising research using heterogeneous designs which can have differing indicators of quality (Mays, Pope, & Popay, 2005). However, quality assessment is strongly urged by systematic review methodologists, as it affects the merit and validity of a systematic review as a whole (Higgins, Altman, & Sterne, 2011; Liberati et al., 2009). Through discussion with my supervisors, I ultimately decided to appraise the included papers using the Mixed Methods Appraisal Tool (MMAT), developed by Pluye, Gagnon, Griffiths, and Johnson-Lafleur (2009). It was decided to not exclude papers based on their quality scores, but rather, to use these quality scores to influence interpretations of the findings. For example, the findings of papers with a higher quality score were compared with the sample of papers as a whole when examining surprising results. Quality scores were included in Table 1 (study summary table) for transparency.

A debate exists on whether studies *should* be excluded from a systematic review on the basis of quality (Mays et al., 2005). There is a trade-off here; whilst including studies of "lower quality" into a systematic review can help to answer your research questions, you inherently accept the risk of drawing inappropriate conclusions as a result of quality issues in the primary studies (Treadwell, Singh, Talati, McPheeters, & Reston, 2011). Additionally, perceptions towards what is an acceptable feature of "quality" in a study might change over time (Paterson, Thorne, Canam, & Jillings, 2001), meaning that a study that may have been excluded at one time would not have been excluded at another.

However, the crucial reason underpinning the decision to include *all* relevant research, was that there is currently not an expansive knowledge base on the therapeutic alliance between a user and a TBI. When a research field is still emerging and at an early stage, use of all evidence is likely to be enlightening and of interest to the field's development (Petticrew, 2015). Furthermore, inclusion of "weaker" studies can inspire later research and identify potential areas of further interest (Petticrew, 2015). This is certainly applicable to therapeutic alliance research

in TBIs, and I strongly felt that all evidence would be valuable to building an understanding of the field. Rather than exclude research from this systematic review based on its quality score, consideration was given to the general methodological issues present in the research base as a whole. The most pertinent issues were described in the findings of the systematic review, with an explanation of how this may have affected the conclusions that can be drawn about the therapeutic alliance between a TBI and its user.

With regard to qualitative research alone, there is a debate over the appropriate criteria upon which to assess qualitative studies (Mays et al., 2005). In comparisons of appraisal checklists by experienced qualitative researchers, there may be little agreement not only between reviewers, but also between tools (Dixon-Woods et al., 2006). Presenting a further obstacle to selecting an appropriate tool for quality appraisal in this review was the inclusion of heterogeneous study designs. Following discussion with my supervisors, I identified and chose the MMAT, a tool that was created following a critical review of the quality appraisal procedures used across a range of mixed studies reviews (Pluye et al., 2009). Whilst the tool is still arguably in its early phases, the level of agreement between reviewers using it appears to be moderate, and use of the tool appears efficient and straightforward (Pace et al., 2012; Souto et al., 2015). Due to the possible limitations of quality appraisal in general, and as this tool is still fairly new, the MMAT scores were treated as advisory, and papers were not excluded as a result of the scores.

2.2.5 Use of a second reviewer

As noted above, systematic review methodology was selected partly due to the emphasis on rigour, transparency, and explicit procedures (Moher et al., 2009). Without the use of pre-specified and systematic procedures for screening, for example, there is the risk of either conscious or unconscious biases in the selection of studies for inclusion into a review (Slavin, 1995). This review used two researchers (myself and BM) as part of the screening process; a recommendation made by Cochrane (Higgins & Deeks, 2011) to reduce the risk of bias in study selection that could result from an individual reviewer's assumptions and judgements.

The use of multiple reviewers can also reduce the risk that relevant research will erroneously be rejected during screening. In support of the effectiveness of this strategy, research has demonstrated that a single reviewer may miss 8% of eligible studies, but a pair of reviewers frequently identify all relevant studies (Edwards et al., 2002). The use of a "second screener" for this systematic review (at title, abstract, and full-text level) was invaluable for ensuring that relevant studies were not missed, and for ensuring that the inclusion/exclusion criteria was applied consistently. By limiting bias in the review's methods where possible, the synthesis of the data is likely to be of a higher quality.

Due to time constraints, it was not possible to have two reviewers independently completing the entirety of data extraction and quality assessment. Although a second reviewer (BM) double-checked a *subset* of the included papers' data extraction, systematic review guidelines recommend that all data extraction is checked by a second reviewer for completeness and accuracy, as a minimum (Centre for Reviews and Dissemination, 2008). Guidelines also recommend that data extraction involves as few free-text fields as possible, to reduce the resources required for this process (Centre for Reviews and Dissemination, 2008). However, data extraction for this review was necessarily detailed and complex, due to the qualitative nature of several of the research questions (see Appendix B for the data extraction forms). As a result, it was not feasible to have two reviewers extract the data independently within the available time frame. In terms of quality assessment, I primarily conducted the quality assessment and all judgements were double-checked by SJ, rather than both reviewers appraising the studies independently. Given the constraints on the research team's time and resources, efforts were made as far as possible to limit the potential biases inherent in data extraction and quality assessment. However, these limitations of the systematic review must be acknowledged, due to their possible influence on the conclusions that can be drawn about the therapeutic alliance in TBIs.

2.2.6 Best-fit framework synthesis

A form of framework synthesis was the analysis approach I chose. This is based on framework analysis, which is a structured, deductive approach taken towards analysing qualitative data (see Pope, Ziebland, and Mays 2000 for a full

description). The approach is deductive as it makes use of existing theoretical concepts to structure data analysis, and thus fits with the general deductive orientation of my thesis. Barnett-Page and Thomas (2009) give a detailed discussion of the use of framework synthesis for literature reviews; it is conducted similarly to framework analysis, in that it takes a highly structured approach to the organisation of data. As my review uses existing theoretical frameworks to conduct the synthesis, this represents a "best fit framework synthesis" (BFFS) approach (Carroll et al., 2011). Whilst an a priori framework is used to begin data analysis, there is also room for new themes which are identified in the data outside the theoretical framework.

Due to the review's aims, I decided that BFFS was an appropriate choice of analysis, as it involves testing an existing theory to examine to what extent it is supported by the available evidence (Booth et al., 2016). A key question was whether there is evidence for the existence of therapeutic alliance aspects in TBIs, and the application of a framework built from existing alliance theories onto the data appeared to be a sensible first step for this. The ability of framework synthesis to also allow for the identification of new themes outside the theoretical framework was felt to be significant for this review, as TBIs are a new therapeutic setting for alliance research. It may be that there are some unique dimensions relevant to therapeutic alliance which have not previously been taken account of by theories which were developed in face-to-face therapies (Clarke et al., 2016). Consequently, there was also a role for inductive reasoning in this largely deductive approach to synthesis. Framework synthesis aims to develop and expand upon existing conceptual frameworks (Booth & Carroll, 2015), which this review paper aims to do with therapeutic alliance theory.

Booth et al. (2016) outline features of various methods for qualitative evidence synthesis, and can be used to help select an appropriate analysis strategy. There were numerous reasons why BFFS was felt to be appropriate, given the review aims. Booth et al. (2016) describe the low attachment to a particular epistemology of this method, and its general position as a "realist" approach to evidence synthesis. This epistemological position is congruent with the review objectives, since I aimed to examine the presence of therapeutic alliance features in the user-TBI interaction, across a range of TBI contexts. As such, I aiming to uncover the "reality" of the human-TBI interaction as per a realist ontological approach, by the use of systematic

methods (with the caveat of acknowledging my limitations of truly knowing this reality, as per the critical realist approach outlined in Section 2.1.1). As also outlined above, there were assumptions made that an interaction of *some sort* (perhaps akin to an alliance) was happening between users and TBIs, due to the large amount of previous face-to-face psychotherapy research. I am hopeful that these findings will be of direct relevance to TBI developers and practitioners, by illustrating ways that a TBI can be more engaging and foster a therapeutic alliance. Indeed, the practical results of BFFS methodology are generally intended to be helpful for groups such as policy makers (Booth et al., 2016).

BFFS is also suitable when a review involves multiple qualitative research questions, which are "fixed" – i.e., they do not change over time (Booth et al., 2016). The review's research questions were mapped out whilst planning the review, and were not edited during the review process. Although the method aims for the comprehensive sampling of all relevant papers, BFFS is less time-intensive than other approaches (Booth et al., 2016). This was highly advantageous for this review, as it was undertaken as part of a postgraduate student project (i.e. this thesis) on an emerging topic, which therefore needed to cover all the currently available evidence. As this was a student project, it was also encouraging to see that the use of BFFS does not necessarily require a high level of expertise (Booth et al., 2016).

Although the framework synthesis approach can be used to integrate both qualitative and quantitative evidence (Booth & Carroll, 2015), the BFFS approach has previously been applied in reviews of qualitative literature only (Booth et al., 2016). Therefore, the approach of this review to include both qualitative and quantitative evidence in a BFFS was somewhat exploratory and challenging, as to my knowledge, an example of this does not currently exist. Booth et al. (2016, p. 20) do point out that "best fit framework synthesis has not been used to integrate quantitative and qualitative data but in principle it meets the requirements of a framework-based mixed methods approach". One example of a mixed studies framework synthesis is the work of Oliver et al. (2008) about public involvement in health services research. Their review took information from a range of research methodologies to inform their framework, but unfortunately did not explain in-depth *how* they addressed the challenges of using multiple types of evidence for a framework synthesis.

In the present review, the most appropriate technique for combining qualitative and qualitative evidence under the same columns of the framework (i.e. various dimensions of therapeutic alliance theory) was not immediately clear without prior examples or guidance. To proceed, I scrutinised the diverse evidence types to see how they diverged or complemented each other; for example, above-average scores on the "bond" subscale of alliance measures were looked at alongside the importance of empathy and encouragement as described in qualitative themes. Together, these findings were taken to indicate the relevance of the "bond" dimension of the alliance.

As mentioned above, therapeutic alliance as it pertains to a human user-TBI interaction is currently an under-researched field. As such, I felt it was important to bring together as much literature as possible, and apply therapeutic alliance theory as a framework to this research. By integrating both qualitative and quantitative evidence into this BFFS, it is hoped that the results of this systematic review are richer, than if it had focused on qualitative or quantitative research alone.

2.2.7 Reflexivity

As part of reflexive research practice, it is necessary to highlight how my role and decisions made impacted upon the research. Whilst the preceding chapters have already tackled this somewhat, I would like to use this section to elaborate upon a few issues that are particularly pertinent to this systematic review's conclusions.

The approach I took to the review was largely deductive (i.e. theory-driven), due to the overall aim of the thesis to examine existing theoretical concepts (i.e. therapeutic alliance elements) in the new context of TBIs. However, some authors have argued for an "epistemological shift" in systematic review methodology, advocating the use of an iterative or flexible approach to the review process (Dixon-Woods et al., 2006). Had I taken this more inductive approach to the review, I would be likely to have reached different conclusions about the alliance or interaction between users and TBIs. With less of an influence of existing theoretical concepts, it is possible that I could have identified other salient aspects of the user-TBI experience which do not map onto existing alliance dimensions.

However, taking a more flexible approach would make it challenging to demonstrate the use of a reproducible and transparent review strategy, as typically

expected of systematic reviews (Dixon-Woods et al., 2006). These requirements point towards the privileging of a positivist orientation within systematic review methodology (Suri & Clarke, 2009). Positivism emphasises conducting research in a value-free manner to accurately uncover the truth (Silverman, 2015); this is reflected in common systematic review techniques which aim to reduce bias, such as consistently applying pre-specified inclusion criteria, and the use of a second reviewer to check screening decisions. This has led to the favouring of certain designs (particularly RCTs) to the exclusion of others in systematic reviews, which has attracted significant criticism (Bearman et al., 2012; Dixon-Woods et al., 2006). Since real-life practice is much more complex than the strictly-controlled situation of the RCT, it has been argued that it may not be appropriate to apply the findings of RCT-based reviews to practice (Dixon-Woods et al., 2006).

By making space for a range of study designs to be included in my review, I attempted to mitigate against this potential limitation of systematic review methodology. However, this is not without epistemological and ontological issues of its own. Literature synthesis methodologies involving primary studies with varied designs may bring together highly differing traditions (Bearman et al., 2012)), and convert context-specific information into a more generalisable arrangement (Barnett-Page & Thomas, 2009), meaning there is an inevitable loss of some information. Furthermore, there may be an epistemological mismatch between the underlying assumptions of qualitative research compared to the traditional methodology of systematic reviews, which makes incorporating qualitative data challenging (Dixon-Woods et al., 2016).

A possible manifestation of this issue can be seen in my review; for example, qualitative themes and questionnaire scores were brought together in the BFFS used to explore the alliance in TBIs. It could be argued that attempts to compare these types of data to one another is questionable, since they represent different research traditions and underlying assumptions about the nature of reality. Despite these possible critiques, I chose to bring these different pieces of information together since the topic of therapeutic alliance in a TBI context is such a new field. As Bryman (2008) suggests, mixed methods research might be done with the aim of producing a more comprehensive account of a phenomenon, and findings from different designs can be used to corroborate one another. Indeed, I felt that all

information was valuable and would support a greater understanding of user experiences of TBI delivery.

Another key area deserving of reflexive attention is the choice of search terms. The terms used targeted mental health problems with a clinical significance, rather than improvement of wellbeing or interventions using positive psychology approach. The research within this thesis has been positioned with a clinical orientation, as I am aiming to influence the delivery of TBIs within the context of clinical services. Thus, the papers covered by this systematic review are limited to the clinical domain, where the focus is on treating an issue rather than the promotion of an already-positive mental state.

As a result, this will limit the conclusions that I can draw regarding therapeutic alliance to a clinical context, and it is impossible to draw firm conclusions about therapeutic alliance in TBIs in the context of improving mental wellbeing. As initial research suggests benefits of online approaches to mental health promotion and positive psychology (e.g. Clarke, Kuosmanen, & Barry, 2015; Proyer, Gander, Wellenzohn, & Ruch, 2014), the role of the alliance in these interventions should be the subject of future research.

2.3 Qualitative interview study: methodology

Qualitative research is concerned with the understanding of people's perspectives, and is centred around interpreting the meanings people ascribe to the experiences they have in their lives (Boeije, 2009; Lapan, Quartaroli, & Riemer, 2011; Snape & Spencer, 2003). The data produced by qualitative methods is rich and detailed, and allows for interpretation and creativity during the analysis process (Boeije, 2009). Qualitative research often involves the identification of meaningful patterns and interpretive themes across the dataset (Boeije, 2009; Patton, 2014). Qualitative methods were deemed to be appropriate as a way of examining the experiences of TBIs users in relation to the dimensions of therapeutic alliance theory.

This qualitative study takes a critical realist position (see Section 2.1.1), as with the systematic review. This approach was chosen in accordance with the wider pragmatic aims of this research, which was to produce useful findings for TBI developers in the creation of more engaging interventions.

Taking a realist approach does not necessarily mean uncovering a single, uncomplicated representation of the phenomenon of interest; it is possible to identify several explanations of a phenomenon that are equally valid (Hammersley, 2004). A realist approach can also acknowledge that the way knowledge is obtained will inherently be guided by existing ideas, which will influence how the underlying reality is viewed (Hammersley, 1992). In the present qualitative study, this is seen in the way that therapeutic alliance theory influenced the interview questions (see Sections 2.3.2 and 2.3.5 for details). Although other interview questions and data analysis went beyond the identification of a priori themes, these did have a degree of influence on the way data was collected and interpreted.

Much of the existing research on the user-TBI therapeutic alliance has been conducted using questionnaire methods. It has typically used adapted versions of measures that were originally developed for a face-to-face context (Berger, Boettcher, & Caspar, 2014; Clarke et al., 2016; Kiluk et al., 2014). However, concerns have been raised that therapeutic alliance components may be different in interventions that do not involve a human therapist, and as a result, current alliance measures may not adequately measure a user-TBI alliance (Clarke et al., 2016).

It is crucial that exploratory work is done to understand users' experiences, to shed light on the form that the alliance might take in a TBI context. Qualitative methods are therefore ideal for addressing a key aim of my thesis; to investigate the applicability of therapeutic alliance theory in TBIs for mental health problems. Indeed, some approaches to qualitative research examine the validity of existing theories to a wider range of settings or contexts (Boeije, 2009). Quotes from participants about their experiences using TBIs can be examined for relevance to the alliance theory dimensions, and to discover which features of a TBI promote or are detrimental to the alliance. It is hoped that this qualitative research will enable a deeper understanding of how TBIs work from users' perspectives, and how features of TBIs can support users' engagement with digital technology. These qualitative findings may also help us to more appropriately adapt or develop alliance measures for use in TBIs.

I took a theory-driven approach to qualitative research, as opposed to a "bottom-up" approach, due to the influence of therapeutic alliance theory on the

conduct of the project (see Section 2.1.2). In this interview study, participants' accounts are being interpreted in light of existing theoretical concepts. To a degree these accounts were "co-constructed" between myself and participants, since I chose to ask theory-driven interview questions. Taking a more bottom-up, inductive approach would produce findings that are differently useful; aspects of the human-technology interaction outside of those which resemble an "alliance" may have been more likely to be identified.

Qualitative interviews, as opposed to other qualitative methods, were judged to be an appropriate strategy for several reasons. First, the ability to access the experiences of users of TBIs directly was a distinct advantage. Previous research has taken a thematic framework analysis approach to scrutinise the content of three TBIs for key features involved in establishing, developing, and maintaining a therapeutic alliance with users (Barazzone et al., 2012). This paper was fascinating, novel and certainly pivotal for my own learning about how the therapeutic alliance may manifest in this treatment context. However, I felt it was also incredibly important to actually examine *from users' perspectives* whether these TBI features are in fact successful in establishing an alliance. As a result, the decision was made to interview TBI users.

Another potential method could have been to arrange a focus group; a type of interview conducted with a group of participants simultaneously, that is particularly interested in the communication between group members (Kitzinger, 1995). I did not opt for focus groups as I was interested in individuals' perspectives, rather than communication between group members. As the treatment format is at least mostly self-guided, the use of a TBI is primarily an individual rather than shared experience. Interviewing participants individually was therefore felt to be a more appropriate data collection method.

Furthermore, since the topic of therapeutic alliance as it relates to digital technology can be viewed as quite unusual, it is possible that taking a group approach would have limited the diversity of responses offered. For example, asking a group of people "do you feel you had a relationship with a computer?" may have been instantly perceived as strange, and produced immediate rejections of the notion. Due to social desirability issues, participants may have declined to comment further

or reflect on parts of the interaction that *did* feel like a relationship. Indeed, it has been suggested that people are reluctant to describe their technological devices using human or anthropomorphic terms (Lupton & Noble, 1997; Wang, 2017). However, it is impossible to know whether this would have happened, without attempting the method. Participants may also have an extremely fruitful and engaging discussion about it with each other; future research could look at this possibility.

2.3.1 Informed consent

Please see the following appendices for full details of the information provided to prospective participants (participant information sheet - Appendix C and study flyer – Appendix D), and the informed consent procedure (consent form - Appendix E).

2.3.2 Use of a topic guide

For the qualitative interviews, a semi-structured topic guide was used. Although this is discussed more briefly in the qualitative interview chapter, here additional information will be provided about the rationale behind some of the included questions. For reference, Appendices F and G contain both full and brief topic guides.

The questions in the topic guide were either intended to obtain a general sense of participants' experiences with the TBI they used, or they were more specific, theory-driven questions about engagement and possible alliance dimensions. Here are some examples of the open, non-theoretical questions we used in the beginning of the interviews (note that the name of the participants' TBI was used during the interviews, rather than just the word "intervention"):

What was your general experience using the intervention?

How would you describe the intervention you used?

What did you find helpful/not so helpful about the intervention?

The more general, less theory-driven questions were asked first, as I wanted to give participants the opportunity to speak openly, without having expressions of their experiences constrained by our terminology. As a notable example, I did not ask whether people saw themselves as having a "relationship" with the TBI they

used until towards the end of the interview (see Section 2.3.5 below for a reflexive discussion around this area). As it was expected that this issue may be contentious, or people might not have *considered* their experiences in terms of a relationship, it was not asked about in the early parts of the interview. This would also allow for the examination of whether people spontaneously used this term.

Another section of the topic guide was dedicated to asking about users' interaction, engagement, and alliance with the intervention they used, to move towards exploring the mechanisms of change and what facilitated continued use of a TBI. There was an influence of therapeutic alliance theory on some questions in this part of the topic guide. Perhaps most obviously, I asked whether peoples' goals for treatment were accounted for by the TBI, which was inspired by the working alliance theory dimension of goal agreement (Bordin, 1979). To develop an alliance, perhaps TBI users would need to feel they could agree on therapeutic goals with the intervention. Related to this was asking about whether the TBI had the capability to help them achieve their goals, which is linked to the dimension of "task agreement" in working alliance theory (Bordin, 1979). Here are some examples of questions inspired by the goal and task agreement dimensions:

Did you have any initial aims or goals when you first started using the intervention? What were they?

Did the intervention help you to achieve these goals, or not? Why?

Which features of the intervention particularly helped you to achieve your goals?

Questions were also asked that might map on to the "bond" element of alliance. In face-to-face therapy, this relates to the quality of the interpersonal relationship between a client and therapist (Bordin, 1979), and the extent to which this exhibits characteristics such as empathy and trust. To achieve this, I asked questions such as:

Did you try to check the quality or trustworthiness of the intervention?

What was the general tone of the intervention?

Did you feel that the intervention "understood" you in any way?

I was also interested in other variables that were felt to be intuitively related to the concept of the alliance as a collaborative process between the person seeking change and a "change agent" (Bordin, 1979, p. 252). As such, I asked multiple questions about user control, the degree of personalisability, and how interactive a TBI was felt to be. It was thought that these dimensions might be analogous to alliance concepts as they arise in client-human therapist alliances, resulting from the emphasis on the ability to use a TBI in the way that was appropriate for users' preferences and needs, which required a degree of two-way interaction. Questions on the topic guide covering these domains included:

How much control did you feel you had in choosing how to use the intervention?

Did the intervention feel "personalised" in any way?

How did the intervention allow you to interact with it?

In summary, the use of a semi-structured topic guide was beneficial for asking about participants' general experiences with the TBI they used, as well as investigating theoretically-derived constructs. As a subset of the interview questions were theory-driven (i.e. the components of working alliance theory), there was a risk that the validity of these components in TBIs may be over-stated. It is not surprising that participants would discuss these dimensions as they were asked about them directly, and they may not have considered them relevant to their TBI experiences without being asked. To increase certainty about the validity of these components, efforts were made during analysis to locate elements of participants' discussions that contradicted the validity of these theoretical dimensions, as well as when relevant discussions to these dimensions took place spontaneously.

2.3.3 Offering interviews via email

Offering an online option for engaging with the interview study was another methodological decision made while planning the research. I was keen to try this lesser-used approach to interviewing, since the sample of TBI users was comprised of people that were likely to possess at least some comfort or substantial experience in using digital technology. As a result, I expected that some participants would be more likely to accept this interview method than the other methods (note: three out of thirteen actually opted to be interviewed online).

Email was chosen as the online interview mode since most people appear to be familiar with the format of email, and have an email account (Hewson & Laurent, 2008). However, it was acknowledged that there may be some added security risks posed by the use of emails for interviews. Participants were made aware on the information sheet and in discussions prior to taking part that email is not completely secure, so that they could make an informed decision regarding participation. Participants were also supplied with tips to promote their online security (see Appendix H).

However, offering email interviews was felt to be advantageous for numerous reasons. Firstly, email interviews might represent a convenient option. Due to the pressures of modern life, many people are busy during the hours that fall within researchers' remit to offer phone or in-person interviews. I was limited to offering phone or face-to-face interviews during regular university/office hours, as it may have been difficult to access clinically-trained supervisors if a risk issue arose out-of-hours. In the case of in-person interviews, there was also a need to have another member of staff available to perform a "safety check" role (for example, contacting the researcher at the scheduled interview end-time to check their wellbeing) as per the university's lone working policy. It was felt that some people might be more likely to participate given the opportunity to read and reply to questions at a time that suits them. In support of this assumption, this was the case for one participant interviewed by email. When feeding back about the process, she noted its usefulness for being interviewed without interruptions. Email interviews were also convenient for the interviewer, as an enormous amount of time was saved by the reduction in the need for transcription and potential travel.

Online interviews can increase the level of control of participants in an interview situation, due to the additional flexibility and taking part in their own environment (Pearce, Thøgersen-Ntoumani, & Duda, 2014), and they also allow time for reflection on a question (Cook, 2012). Additionally, the enhanced privacy of communicating via email may help participants to disclose more about their personal or stigmatising experiences (McCoyd & Kerson, 2006). Therefore, including email as an option might be beneficial for participants that feel nervous about participating in an interview; email allows them time to think about their answers, and maybe feel less "on the spot". Since some of the questions might be seen as "strange" (for

example, when asked about having a relationship with a TBI), the added time available may help participants to deeply reflect upon their answer before responding.

Additionally, it was hoped that by offering a range of either spoken (phone and face-to-face) or written (email) interview options that people with hearing or visual difficulties would not be prevented from participating in the study. I would also like to note that participants were also not necessarily excluded due to language requirements, since funding was available to cover the costs of translators and interpreters. However, no prospective participants had any of these additional needs. As such, this information has not been included in the main report of the qualitative interviews, although I feel it is important to note here that these possibilities were taken into account.

2.3.4 Analysis methods

Thematic analysis was chosen as the approach to analysing the interview data; specifically, following Braun and Clarke's (2006) thematic analysis method. The procedural steps taken to analyse the data are outlined in the qualitative interview chapter and detailed in Appendix I; this methodology chapter will explain more about why I selected this approach. Thematic analysis was deemed to be appropriate because of the ability to identify thematic patterns within a dataset in rich detail, and examine commonalities and differences across participants' accounts (Braun & Clarke, 2006). As the aims of the qualitative interview project include the exploration of users' experience, engagement, and therapeutic alliance with TBIs, I felt that thematic analysis would be beneficial for identifying common themes across different participants' experiences. Braun and Clarke (2006) also note that thematic analysis is a flexible method which is not tied to one single epistemological position, and therefore the use of this strategy was also not in conflict with the wider critical realist position of the qualitative interview study.

Another possible approach, grounded theory, involves the *discovery* and *generation*, rather than verification, of theory from the data (Glaser & Strauss, 1973). However, my thesis was essentially concerned with the nature of therapeutic alliance in TBIs, and it was useful to interpret the findings in the context of existing theories about the therapeutic alliance. Thematic analysis allows for the interpretation of

findings in light of existing theoretical frameworks to add interpretative depth (Braun & Clarke, 2006), and so appeared to be an appropriate method. However, that these existing theoretical concepts did not rigidly guide the data analysis. Themes regarding user engagement with TBIs were identified that emerged from data, and did not simply reflect *only* the dimensions of therapeutic alliance theory. The transcripts were coded for recurrent and significant concepts across participants' accounts of their engagement with a TBI, which were not limited to therapeutic alliance variables.

Often there is criticism of thematic analysis for being vague and insufficiently transparent about how conclusions have been reached (Braun & Clarke, 2006), with the method often poorly or inconsistently applied (Braun & Clarke, 2014). I was keen to avoid these criticisms, by using a transparent and systematic analysis strategy. As Attride-Stirling (2001) states, the production of meaningful results is dependent upon rigorous recording and reporting of the techniques used when conducting thematic analysis.

Braun and Clarke (2006) have outlined an explicit method for thematic analysis that involves 6 key steps, which I used in this study (see Appendix I). Braun and Clarke (2014) point out that thematic analysis is a method that is relatively easy to learn, and therefore is a well-suited method when there are team members less experienced with qualitative research. As the steps of this analysis method are made clear and explicit, it was certainly helpful for a novice researcher like myself.

The use of qualitative analysis software was also highly useful as a novice researcher. I opted for NVivo (QSR International Ltd, 2017), which has a user-friendly and intuitive interface. Apart from the time spent learning to use the software, I believe it increased the efficiency of the qualitative analysis process. Helpful features of qualitative analysis software include: the ability to construct hierarchical lists of codes; efficient retrieval of sections of text coded under a particular code; and the viewing of a coded extract in its original context to reduce the risk of the analysis becoming "fragmented" (Liamputtong, 2009). NVivo made it eaiser to connect disparate parts of text by the use of "nodes" (i.e. coding), which could be pulled up and examined alongside each other. Use of a coding hierarchy also helped to maintain a rigorous and systematic approach to coding.

2.3.5 Reflexivity

As with the reflexivity section above (2.2.7) pertaining to the systematic review, I would like to elaborate upon the impact of a few particular methodological decisions relating to the qualitative interview study.

Firstly, decisions about where to recruit participants from influence the conclusions that can be drawn about therapeutic alliance in TBIs. Some recruitment took place in several NHS trusts in North West England and a third sector service that offered TBIs as a treatment option. I felt it was useful to recruit participants from established services, and the team decided it would be beneficial to hear from people that had used TBIs in real-world settings. This relates to the wider positioning of study into a clinical services context; as I hope to influence TBI service delivery, it seemed appropriate to understand the perspectives of those using these services.

I should note that the study was also advertised more widely by a range of further strategies (for example: posting on the Spectrum Centre's website and social media; information circulated in relevant mailing lists). This meant that participants could self-refer into the study via these means, and were not necessarily in current contact with clinical services. However, part of the inclusion criteria pertained to participants' presenting with a mental health problem of clinical significance, and the TBI used must have a clinical orientation. As with the systematic review, my conclusions about therapeutic alliance in TBIs are limited to a clinical context, as I did not interview those using TBIs for general wellbeing or with a positive psychology orientation.

In the interviews, I asked participants whether they considered themselves to have a *relationship* with the TBI they used, as opposed to a *therapeutic alliance.* There were compelling reasons for doing this, owing to the possible complications of and risk of bias when using academic terminology with interview participants (Potter & Hepburn, 2005). Following team discussion, I felt that the term "alliance" may not be easily understood by participants, and that it is typically a term used only by clinicians and researchers. I was keen to not alienate or confuse participants by using inaccessible language.

Although asking about the *alliance* would have been technically more conceptually consistent, it was decided that the need to ask questions that would

actually hold meaning and be intelligible to participants outweighed this. Whilst participants' answers to the "relationship" question still provided incredibly valuable data for exploring the nature of the therapeutic alliance in TBIs, it's important to note that this "translation" may limit the extent to which I can make particular conclusions about the alliance.

Potential bias is introduced into the findings by the research interests and background of the research team. The team is comprised of academics that are actively developing and evaluating TBIs which could be used as part of service delivery in the NHS (for example, Jones et al., 2017; Lobban, Dodd, et al., 2017; Lobban, Robinson, et al., 2017). It is likely this has influenced the findings somewhat, as the team is highly interested in the factors which influence user engagement with such systems. These findings are of vital concern to the team, as they will inform future TBI developments. As a result, the team was likely to be biased towards identifying positive experiences that people have during TBI use, and perhaps less likely to recognise elements of the data which indicate the unacceptability of these approaches to service users. In light of this, my findings about the user-TBI alliance may be biased towards a more positive view of this treatment format.

2.4 The joint contribution of a systematic review and a qualitative interview study

Finally, I would like to address how the systematic review and qualitative interview methods relate to each other. Although there was some overlap in the time at which each project was undertaken, the preliminary findings of the systematic review informed and supported the analysis of the qualitative interviews. For example, papers included in the systematic review indicated the importance of personalisation of a TBI (as will be illustrated in more detail in the subsequent chapter). This highlighted the significance of that feature, leading to the examination of personalisation in further detail in the qualitative interview study.

As the therapeutic alliance in a TBI context is a fairly novel and still-emerging research area, there was a need to select methods to support an understanding of everything known so far (the systematic review) and a method for exploring the therapeutic alliance concept in a detailed way (the qualitative

interviews). With regard to epistemology, both the systematic review and qualitative interview study were undertaken with a critical realist approach, as discussed in detail above. These methods have both provided contributions towards answering the overarching research question of the thesis: what is the nature of the therapeutic alliance in the context of digital technology-based interventions (TBIs) for mental health problems? The combination of methods have also allowed me to answer, in different ways and by different means, overlapping research questions. For example, does the therapeutic alliance remain a valid concept in the context of TBIs? How is this alliance viewed, and which terms are used to refer to it? Which factors influence the alliance in TBIs? I hope that when the findings of each are considered alongside each other, they provide a useful knowledge base for answering this key question.

The nature of the human-technology relationship in technology-based interventions for mental health problems: a systematic review and best-fit framework synthesis

3.1 Abstract

Background: Mental health treatment delivered via digital technology can potentially improve access to effective psychological services. Little is known about how these "technology-based interventions" work or the validity of the therapeutic relationship in a treatment context that has less of a role for a human therapist.

Objectives: The aim of this systematic review is to provide an understanding of the nature of the human-technology relationship in TBIs for mental health problems, particularly the relevance of the therapeutic alliance.

Methods: A systematic review was undertaken, which included qualitative, quantitative and mixed methods research. Academic Search Complete, PsycINFO, PubMed, Scopus and Web of Science were searched for relevant research, ultimately including 13 papers. The data were analysed using a best-fit framework synthesis approach.

Results: Many of the components of alliance that have been investigated in a face-to-face context remain applicable to TBIs. Two added dimensions that may be specific to a user-TBI alliance are interactivity and availability. A range of factors were investigated for their influence on the user-TBI alliance, including user and TBI characteristics. Generally, the user-TBI alliance was not associated with clinical outcomes. Findings regarding treatment satisfaction were conflicting, but the alliance was largely found to be associated with indicators of users' engagement with TBIs.

Conclusions: Further research is needed to explore therapeutic alliance experiences of TBI users in detail, and to develop new measures of the alliance which are specific to a TBI context.

3.2 Introduction

Common factors across therapies may be responsible for up to 30% of therapeutic change (Lambert & Barley, 2001), and research on these common factors has often focused on qualities of the relationship between therapist and client. For instance, therapeutic alliance theory has included concepts such as empathy, perceptions of therapist credibility, and patient empowerment (Elvins & Green, 2008). One of the most widely used is Bordin's (1979) working alliance theory, concerned with the client and therapist's joint involvement in collaborative, purposive work within therapy (Hatcher & Barends, 2006). There are three fundamental aspects to this collaborative work: agreement between client and therapist on therapeutic goals; agreement upon therapeutic tasks needed to achieve the goals; and the quality of the client and therapist's interpersonal bond (Bordin, 1979). The therapeutic alliance is a pantheoretical concept, which applies regardless of the therapeutic approach (Horvath & Luborsky, 1993).

Meta-analyses indicate a modest but reliable relationship between the quality of therapeutic alliance and outcomes of therapy, with aggregated r values ranging from .22 – 2.75 (for example, Horvath et al., 2011; Martin et al., 2000). Although concerns have been raised about the correlational nature of the majority of alliance research, recent investigations using instrumental variable modelling support a causal role of therapeutic alliance for therapy outcomes; engaging in therapy when a strong alliance has been established is beneficial, but when alliance levels are poor, engaging in therapy is detrimental (Goldsmith et al., 2015).

It seems clear that the therapeutic alliance is critical for the success of face-to-face mental health treatment. But what about treatments that might not actively involve a *human* therapist? There has been a growth in the development of therapies which are delivered by digital technology and the internet (Barak et al., 2009). However, there have also been concerns expressed about these technology-based approaches, often around the lack of therapeutic relationship, or perceived difficulties in establishing an alliance (Fleming & Merry, 2013; Stallard et al., 2010).

While there are a range of approaches which incorporate digital technology in some way, this review covers a particular category of treatment. Web-based therapeutic interventions often take the form of structured treatment packages that deliver content in a modular format, make use of multimedia and interactivity, and may provide automated, tailored feedback (Barak et al., 2009). Although primarily self-guided, they may feature support from a therapist or other helper (Barak et al., 2009). The terminology used for this review is "technology-based intervention" (TBI; Kiluk et al., 2014) to also cover interventions which meet the criteria above, but are delivered without the use of the internet (for example, a computer program or a mobile phone).

Meta-analyses and systematic reviews have found that: computerised treatment can reduce symptoms and improve recovery in depression (Richards & Richardson, 2012); mobile phone applications can reduce depression, stress, and substance use (Donker et al., 2013); and internet and mobile-based interventions appear to be feasible and acceptable for psychosis treatment (Alvarez-Jimenez et al., 2014). While many interventions are cognitive behavioural therapy(CBT)-focused (Barak et al., 2009), other approaches have also been used. For example, online mindfulness has demonstrated improvement in stress and symptoms of depression and anxiety (Cavanagh et al., 2013). In terms of efficiency, evidence suggests that TBIs are potentially highly cost-effective (Hedman et al., 2012; Ramsey, 2015).

Although a therapeutic relationship between client and therapist may not be present, can qualities of the relationship between user and technology be influential instead? Technology-based approaches may still provide a channel for the common factors of therapy (Peck, 2010), and some TBIs evidence attempts to promote therapeutic relationship features (Proudfoot, 2004). As an example, anthropomorphic "agents" (on-screen entities; Beale & Creed, 2009) may be incorporated into health change interventions, which might add more interpersonal dimensions and improve the human-technology relationship (for example, Bickmore & Picard, 2005).

Without using such agents, TBIs might mimic features of the therapeutic relationship in other ways, perhaps by the provision of corrective feedback via

automated algorithms (Helgadóttir, Menzies, Onslow, Packman, & O'Brian, 2009). Evidence of this in action is provided by a study which qualitatively analysed computerised treatments targeting depression (Barazzone et al., 2012). It was found that numerous strategies were used to create a collaborative relationship, such as providing feedback, as well as the formation of agreed goals between the user and the intervention. This clearly relates to Bordin's (1979) conceptualisation of the alliance in therapy as a collaborative process, and indicates that the alliance may remain relevant to TBIs, albeit in a different way.

Other studies have adapted measures to reflect the alliance between user and the *technology* itself, rather than the alliance between user and human therapist. To illustrate with an example, Kiluk et al. (2014) adapted the Working Alliance Inventory (WAI; Horvath & Greenberg, 1989), which is based on Bordin's (1979) model of the alliance. This resulted in the creation of the WAI-Tech, which was adapted by substituting the word "therapist" for the name of the computerised therapy program. A systematic review of papers that have taken similar approaches to Kiluk et al. (2014) will allow these findings to be synthesised, to produce an understanding of the current state of the field.

The present review will also include TBIs delivered by smartphone, since it is suspected that smartphones present unique features which may facilitate a human-technology relationship. Smartphones are commonly used in everyday life and often allow for a continuous internet connection, meaning that an intervention could be accessed in a wide range of locations or circumstances (Donker et al., 2013; Gravenhorst et al., 2014; Ramsey, 2015). This increased availability as well as the familiarity of an everyday device may support the development of an alliance with a smartphone-delivered intervention.

Considering all of the above, it seems that the nature of the human-technology relationship in TBIs is a worthy subject for detailed investigation. An understanding of this could help us design better, more engaging TBIs, and to understand why some TBIs may be more effective for improving mental health than others. It could also help us extend and build upon theories of therapeutic alliance,

which need exploration in non-traditional therapeutic settings (Elvins & Green, 2008).

3.2.1 Research aims

The overall aim of this systematic review is to provide an understanding of the nature of the relationship between human and digital technology in the context of TBIs for mental health problems, particularly concerning the relevance of the therapeutic alliance.

Specifically, the primary aims of this systematic review are:

- To identify the terms and concepts used regarding the relationship between human and technology in the context of TBIs for mental health problems.
- To ascertain whether the working alliance model of the therapeutic alliance remains valid in a TBI context.
- To provide an understanding of the factors which influence the human-technology relationship.

The secondary aims of the review are:

- To identify the measures used to assess the human-technology relationship within TBIs.
- To review research regarding the ability of the human-technology relationship to predict the outcomes of TBIs for mental health problems.

3.3 Methods

Qualitative research can provide rich and detailed insights regarding health-related experiences (Hawker, Payne, Kerr, Hardey, & Powell, 2002). It was decided that the inclusion of qualitative research was likely to present in-depth data regarding users' experiences of the human-technology relationship when engaging with a TBI. Accordingly, both qualitative and quantitative designs were included in this review, forming a systematic mixed studies review (SMSR; Pluye et al., 2009).

3.3.1 Search strategy

The following databases were searched: Academic Search Complete; PsycINFO; PubMed; Scopus; and Web of Science. They were chosen because they index literature from a wide range of relevant health professions, and cover technology and health. The indexing of relevant journals was also checked to ensure they were covered by these databases.

Groups of search terms were devised to locate papers covering the following: psychological interventions; an "online" or "digital technology" focus; the therapeutic alliance or relationship; and mental health (see Appendix A for full search terms and strategies). Search strategies differed only in the available MeSH or thesaurus terms in each database to narrow the results down to mental health. Some search terms ("online" words and "intervention" words) were limited to the abstract, to ensure relevance of results and a minimisation of "noise".

The "alliance" words were searched for in the "full text" or "all" field. This was to pick up papers that did not have therapeutic alliance as a core focus of the paper, but might still have investigated the construct.

As searching databases may only yield 50% of all relevant research (Whittemore & Knafl, 2005), backwards and forward tracking of included papers was also undertaken. Google Scholar was used for forward tracking, as well as database functions (Web of Science in the first instance; PsycINFO if the paper is not indexed in Web of Science).

3.3.2 Inclusion and exclusion criteria

3.3.2.1 Study design

Peer reviewed papers using qualitative, quantitative, or mixed methods were included which presented the results of a published primary research study in English.

3.3.2.2 Participants

The participant groups were those that used a TBI to improve their mental health. Participants were not required to have a diagnosis of any particular condition, and there was no age limit. Participants that used a TBI *only* for something other than a

mental health condition (for example a physical health issue, neurological disorders, or developmental disorders) were not eligible for inclusion. Studies which had any groups other than mental health service users (for example therapists/clinicians) as the only providers of relevant data were also excluded. This criterion was set because we wished to understand therapeutic alliance experiences directly from those using TBIs.

3.3.2.3 Interventions

To be included, participants must have used an intervention which is consistent with the definition of "technology-based interventions" (TBI). Firstly, the intervention had to be technology delivered: it may be accessed via computer program, CD-ROM, website or smartphone application (not necessarily an exhaustive list). It must be mainly accessed on a self-help/self-guided basis, although some human support to use the intervention was acceptable. Interventions that still have contact from a human therapist as the key delivery method for the therapy (for example, videoconferencing or email therapy) were excluded. The intervention had to be used on an individual basis, as opposed to a family-focused intervention, for example. It must be primarily focused upon mental health change; interventions focusing solely on other issues, such as physical health, were excluded. Whilst CBT-based TBIs are the most common, any theoretical approach was acceptable.

3.3.2.4 Relevance to the human-technology relationship

Relevance to therapeutic alliance, therapeutic relationship, or human-computer interaction had to be demonstrated. The paper could demonstrate this by containing a measure of therapeutic alliance or relationship, which has been applied to a person's relationship with the technology (i.e. excluded if the measure was applied to a human therapist). Alternatively, a paper was included if somewhere in the method, results, or discussion section, there was a stated relevance to the therapeutic alliance, therapeutic relationship or human-computer interaction (for example, in qualitative themes).

3.3.3 Screening

The records retrieved from database searching were first downloaded into Endnote Web. Duplicates were excluded, initially by using the Endnote Web function and

after that, manually by LH. Screening of the results was also conducted using Endnote Web.

Records retrieved in the search strategy were screened at multiple levels (title, abstract, full text) by two researchers (LH and BM). At each stage, the researchers met to discuss their decisions for each record. Discrepancies were discussed and resolved with reference to the criteria outlined above. In the event that a discrepancy could not be resolved, senior members of the research team (FL and SJ) were consulted. At each stage, a subset of papers were screened (for example, the first 10%) to check criteria and clarify any issues before proceeding with the rest of the screening. Figure 1 summarises the screening procedure, consistent with PRISMA guidance (Liberati et al., 2009).

3.3.4 Data extraction

Two data extraction forms were constructed (see Appendix B). The first form concerned the "key study details", for example: the sample's clinical issues; TBI format; and methodology details. The second form was used to extract data for the framework synthesis (see "Analysis Strategy"). Data was extracted here about the measurement of participants' relationship with the TBI, or whether a paper had studied the association of other factors with therapeutic alliance strength.

Data extraction was performed primarily by LH, with BM checking a subset (23%) of the papers.

3.3.5 Quality assessment

Papers were quality appraised using the Mixed Methods Appraisal Tool (MMAT; Pluye et al., 2009) which provides a method for appraising mixed methods studies. Papers were not excluded on the basis of quality, as all relevant findings were viewed as potentially valuable for adding to our understanding. Furthermore, previous examples of framework synthesis exist in which studies are not excluded on the basis of quality (for example, Carroll et al., 2011). A consideration of the methodological issues present in the papers contributes instead towards the synthesis.

Quality assessment was performed primarily by LH, and SJ checked the appraisal of all papers. See Appendix J for the full scoring of each paper.

3.3.6 Analysis strategy

"Best fit framework synthesis" (Carroll et al., 2011) was the selected analysis approach. Whilst an a priori framework is used to begin analysis, there is also room for new themes which are identified in the data outside the framework. This review paper aims to examine whether therapeutic alliance theories remain valid in TBIs, by applying a framework built from existing theories onto the data, whilst also inspecting the data for additional, emergent alliance dimensions.

The framework structure was informed firstly by Bordin's (1979) tripartite model of the therapeutic alliance and the additional dimensions of the Agnew Relationship Measure (ARM; Agnew-Davies et al., 1998): a sense that the client and therapist are working together jointly (partnership); optimism about treatment (confidence); the degree to which the client can take control over the therapy's direction (client initiative); and feeling able to disclose personal issues without fear of judgement (openness). Framework synthesis was used to explore the model of the therapeutic alliance in TBIs, the factors that influence this alliance, and whether this alliance was connected with outcomes of therapy.

Due to the heterogeneity of the included studies in this review, a meta-analysis of the quantitative data was not feasible.

3.4 Results

3.4.1 Search results and screening

Databases were originally searched on 6th November 2015, and updated on 22nd June 2017. Figure 1 illustrates of each screening stage. 2541 records were screened, with 13 papers ultimately included.

Figure 1. Flowchart illustrating the search and screening process.

```
┌──────────────────────────┐                    ┌──────────────────────────┐
│  Records retrieved from  │                    │   Duplicates excluded:   │
│    database searching    │ ─────────────────▶ │        N = 556           │
│        N = 2486          │                    └──────────────────────────┘
└──────────────────────────┘
            │                                   ┌──────────────────────────┐
            ▼                                   │ Records excluded at title│
┌──────────────────────────┐                    │          level           │
│  Records screened at title│                   │ Further duplicates       │
│          level            │ ───────────────▶  │ identified: N = 10       │
│        N = 1930          │                    │ Clearly irrelevant:      │
└──────────────────────────┘                    │ N = 719                  │
            │                                   │ Total excluded = 729     │
            ▼                                   └──────────────────────────┘

┌──────────────────────────┐                    ┌──────────────────────────┐
│  Records screened at     │                    │ Records excluded at      │
│     abstract level       │                    │ abstract level           │
│        N = 1201          │ ───────────────▶  │ Further duplicates       │
└──────────────────────────┘                    │ identified: N = 9        │
            │                                   │ Not primary research:    │
            │                                   │ N = 474                  │
            │                                   │ Not mental health service│
            │                                   │ user participants: N=279 │
            │                                   │ Intervention criteria not│
            │                                   │ met: N = 233             │
            │                                   │ Total excluded = 995     │
            │                                   └──────────────────────────┘
            ▼
┌──────────────────────────┐    ┌──────────────────────────┐
│ Records screened at full │    │ Further papers identified│
│      text level          │◀── │ for full text screening  │
│ N = 261 (206 from        │    │ from additional strategies│
│ database searches, 55    │    │        N = 55            │
│ from additional          │    └──────────────────────────┘
│ strategies)              │    ┌──────────────────────────┐
└──────────────────────────┘    │ Records excluded at full │
            │         ────────▶ │ text level               │
            │                   │ Publication type/not     │
            │                   │ primary research study:  │
            │                   │ N = 35                   │
            │                   │ Not mental health service│
            │                   │ user participants: N = 21│
            │                   │ Intervention criteria not│
            │                   │ met: N = 33              │
            ▼                   │ No human-technology      │
┌──────────────────────────┐    │ relationship relevance:  │
│        Included           │    │ N = 159                  │
│         N = 13           │    │ Total excluded = 248     │
└──────────────────────────┘    └──────────────────────────┘
```

The Kappa coefficient for title screening: 0.63 (SE = 0.020), abstract screening 0.717 (SE = 0.026) and full text-level screening 0.742 (SE = 0.093) indicated substantial agreement (Landis & Koch, 1977), similar to agreement levels in other reviews of digital technology and health (Brown et al., 2016; Deady et al., 2017).

3.4.2 Key study details

Table 1 summarises the main details and quality of each paper. Papers predominantly assessed the therapeutic alliance in TBIs (n = 12); 3 provided qualitative data. Clinical issues covered included depression, anxiety disorders, stress, substance abuse and adjustment disorder. Computerised or online CBT was the most frequent TBI format (n = 10), others included virtual/augmented reality-based TBI, a problem-solving TBI, and a TBI using motivational interviewing/counselling. See Appendix K for the codes that correspond to each included study alongside its full reference, and Appendix J for the full MMAT scoring of each paper.

3.4.3 Which terms and concepts are used regarding the human-technology relationship in a TBI context?

A range of terminology was used, from "relationship", "alliance" and "connection", to the "virtual relationship" and the more theory-oriented "working alliance". Many papers did not define the human-technology relationship. Those that did (*3, 7, 9, 12*) spoke of the therapeutic alliance as involving collaboration and cooperation, a strong affective bond or emotional connection, and agreeing on the goals and tasks of therapy, which maps onto working alliance theory (Bordin, 1979). Many papers that did not offer definitions used adapted alliance measures (see "Which measures have been used to assess the human-technology relationship within TBIs?"). The use of these suggest concepts such as collaboration, agreement on therapeutic tasks and goals, a strong bond, and openness were considered to be underlying alliance components.

Table 1: Key study details including quality assessment (MMAT) scores

Key	Authors & year	Location	Clinical issue	Sample size	TBI details	Sessions	Study design	Alliance data source	MMAT score
1	Berger et al. 2014	Switzerland, Germany & Austria	Social anxiety disorder, panic disorder, generalised anxiety disorder.	88	Internet-based cognitive behavioural self-help. Email contact with therapist. 2 conditions – tailored and standardised.	8 weekly sessions.	RCT, 6-month follow-up.	Adaptation of Working Alliance Inventory Short Form Revised (WAI-SR; Munder et al., 2010)	50%
2	Berman et al. 2014	USA	Depression.	29	Problem-solving self-guided computer program (ePST) Non-clinician supporter available for questions. Clinic access.	6 sessions over 9 weeks.	Preliminary uncontrolled trial.	Adaptation of Agnew Relationship Measure (ARM; Agnew-Davies et al., 1998).	50%
3	Clarke et al. 2016	Australia	Depression, anxiety and/or stress.	90	Fully automated, self-guided CBT (MyCompass) accessed online via phone, tablet or computer. No therapist contact.	12 modules.	Secondary analysis of RCT, 20-week follow-up.	Adaptation of the ARM (Agnew-Davies et al., 1998). Qualitative interviews ($n = 16$).	25%
4	Gega et al. 2013	UK	Depression, or mixed depression and anxiety.	*6*	Computerised CBT (Beating the Blues). CBT therapist present at each session. Clinic access.	8 modules over 6 weeks.	Mixed-methods repeated-measures case series.	Adaptation of Session Impacts Scale (SIS; Elliott & Wexler, 1994). Qualitative interviews.	33%
5	Kiluk et al. 2014	USA	Cocaine dependence.	34	Computerised CBT (CBT4CBT) Research staff available if any questions during sessions. Clinic access.	7 modules.	Randomised trial, 6-month follow-up.	Adaptation of WAI (Horvath & Greenberg, 1989).	75%

Note: sample size refers to the number of participants that used a TBI in the sample and provided alliance-relevant data (i.e. excluding a control group).

Table 1 continued: Key study details including quality assessment (MMAT) scores

Key	Authors & year	Location	Clinical issue	Sample size	TBI details	Sessions	Study design	Alliance data source	MMAT score
6	Kiluk et al. 2016	USA	Alcohol use disorders.	46	Computerised CBT (CBT4CBT). Clinic access. Support not reported.	7 modules.	Randomised Stage I pilot trial, 6-month follow-up.	Adaptation of WAI (Horvath & Greenberg, 1989).	75%
7	Miragall et al. 2015	Spain	Phobia or adjustment disorder.	75	Virtual and augmented reality therapy involving exposure. Therapist available.	1 x 3 hour session, 6 sessions over 3 weeks, or 6 weekly sessions.	Observational quantitative study.	Adaptation of WAI Short Form (WAI-S; Tracey & Kokotovic, 1989).	25%
8	Morie et al. 2015	USA	Cocaine dependence.	73	Computerised CBT (CBT4CBT) Clinic access. Research staff available for questions.	7 modules.	Secondary analysis of trial data	Adaptation of WAI (Horvath & Greenberg, 1989).	25%
9	Ormrod et al. 2010	UK	Anxiety and depression.	16	Computerised CBT (Beating the Blues) Clinical staff available at each session. Clinic access.	8 weekly sessions.	Pilot study, one intervention group	Adaptation of ARM (Agnew-Davies et al., 1998).	25%

Note: sample size refers to the number of participants that used a TBI in the sample and provided alliance-relevant data (i.e. excluding a control group).

Table 1 continued: Key study details including quality assessment (MMAT) scores

Key	Authors & year	Location	Clinical issue	Sample size	TBI details	Sessions	Study design	Alliance data source	MMAT score
10	Purves & Dutton 2013	UK	Depression	7	Computerised self-help CBT (Blues Begone) CD-ROM installed on participants' personal computer. Researcher available if any concerns.	30 episodes, 5 episodes completed per week over 8-12 weeks.	Qualitative study.	Qualitative interviews.	75%
11	Richards et al. 2013	Ireland	Depression	43	Online self-guided CBT (Beating the Blues). No therapist input.	8 weekly sessions.	Randomised parallel group trial.	Adaptation of WAI-SR (Hatcher & Gillaspy, 2006)	25%
12	Scherer et al. 2016	Switzerland	Pregnant women with pre-term labour; stress.	31	Internet-based cognitive-behavioural stress management. Regular contact with therapist.	6 weekly modules.	Part of a randomised controlled trial.	Adaptation of WAI-SR (Hatcher and Gillaspy, 2006).	25%
13	Serowik et al. 2014	USA	Psychiatric problems connected to military service.	25	Benefits counselling website to help veterans engage in work and related activities. Designed to simulate a counselling/motivational interviewing session. Therapist input not reported.	3 sessions.	Observational design using mixed methods.	Adaptation of the WAI (Horvath & Greenberg, 1989)	25%

Note: sample size refers to the number of participants that used a TBI in the sample and provided alliance-relevant data (i.e. excluding a control group).

3.4.4 Are current models of the therapeutic alliance valid in a TBI context?

Table 2 indicates which papers examined which therapeutic alliance dimensions, and Appendix L contains full data for this synthesis.

Working alliance theory dimensions were most frequently studied. Quantitative results indicated that an affective bond could be established with a TBI, as scores on the bond subscale of both the ARM and WAI were above the neutral midpoint across a range of TBIs and clinical groups (*2, 3, 5, 6, 9, 11, 13*). Where reported, internal consistency of the subscale was also strong (above .70 – *2, 3, 5, 7, 9, 11*). This was supported by qualitative themes (*3, 4, 10*), in which users expressed the importance of empathy, trust, and encouragement. Users also noted as significant attempts by TBIs to demonstrated empathy which failed; specifically, the use of spoken verbal responses (*4*).

Quantitative results usually indicated that participants felt they could work towards their goals with a TBI using appropriate tasks, evidenced by the higher-than-average goal and task scores on the WAI or ARM (*1, 5, 6, 11, 13*; *12*). These subscales' internal consistency was also strong where reported (at least .70 – *1, 5, 7*). Qualitative themes (*3, 4, 10*) supported this; users were frustrated when felt they could not work towards certain goals, or the content of the TBI was irrelevant to their needs. Participants also discussed the benefits of a personalised approach within TBIs.

The sense of collaboration or partnership was assessed by several papers (*2, 3, 9*) by using the ARM. This dimension can be viewed as conceptually similar to "goals" and "tasks" above, as it relates to feeling that user and TBI are working jointly during treatment. TBIs were rated higher than the neutral midpoint on this dimension, and qualitative themes (*3*) contained participants' discussions regarding a feeling of collaboration.

Fewer papers considered the other ARM components; confidence, openness, and client initiative. "Confidence" assesses optimism in treatment; confidence scores were above average (*2, 3, 9*), but the internal consistency was not always high (for example $\alpha = 0.68$, *9*). However, qualitative themes indicate that users did feel confidence in the program and the usefulness of the skills it taught (*3*).

With regard to "openness" (feeling free to disclose personal issues without judgement), it seems intuitive this would be key to the therapeutic alliance in TBIs, due to enhanced perceptions of privacy and anonymity in this treatment format. The TBIs were rated highly on openness (*2, 3, 9*), and qualitative themes (*3*) indicated the value of privacy to users. The internal consistency of the openness scale was not always high, with the exception of (*3*). This could be because the TBI used in (*3*) was *fully* self-automated and could be accessed from home, which may have meant that privacy was more relevant in this sample.

The papers that measured "client initiative" (the degree to which the client can take control over the therapy's direction) all found poor psychometrics in the subscale, although mean scores indicated that clients felt a level of control over their TBI use (*3, 9*).

There were two additional themes identified qualitatively (*3*), which may be unique to alliance in TBIs, and are absent from existing alliance models. The first is "interactivity" – participants noted the significance of inputting data, resulting in the TBI's personalised feedback. This may mimic to a certain extent features of a human relationship, that can respond and reflect back an individual's experiences to them. On the other hand, this provision of feedback was sometimes felt to put added pressure on the person.

The second new theme was "availability", as participants valued the ability to access a TBI flexibly. This could be a dimension of the user-TBI alliance, as it points towards the significance of a reliable relationship; the TBI is available to a user whenever and possibly wherever (if using a portable device) they need it.

In summary, it appears that many of the components of alliance that have been investigated in a face-to-face context remain applicable to TBIs. Two components that may be specific to a user-TBI alliance are interactivity and availability.

Table 2: Therapeutic alliance components investigated by included papers

	Goal	Task	Bond	Collaboration/ partnership	Confidence in treatment	Openness	Client initiative	Interactivity	Availability
1. Berger et al. 2014	✓	✓							
2. Berman et al. 2014			✓	✓	✓	✓	✓		
3. Clarke et al. 2016	✓	✓	✓	✓	✓	✓	✓	✓	✓
4. Gega et al. 2014	✓	✓	✓						
5. Kiluk et al. 2014	✓	✓	✓						
6. Kiluk et al. 2016	✓	✓	✓						
7. Miragall et al. 2015	✓	✓	✓						
8. Morie et al. 2015	✓	✓	✓						
9. Ormrod et al. 2010			✓	✓	✓	✓	✓		
10. Purves & Dutton 2013	✓	✓	✓						
11. Richards et al. 2013	✓	✓	✓						
12. Scherer et al. 2016	✓	✓							
13. Serowik et al. 2014	✓	✓	✓						

3.4.5 Factors influencing the human-technology relationship

A variety of factors were investigated for their association with the human-technology alliance. See Table 3 for an overview of variables or themes investigated by each paper, and Appendix L for the full framework structure. Conceptually similar factors were grouped into themes, which will now be addressed in turn.

3.4.5.1 TBI characteristics

Tailoring

People using a TBI tailored to their individual mental health needs (as opposed to a standardised format) rated it higher on the goal and task dimensions of alliance (*1*), meaning that it was perceived as more able to take account of their treatment goals and preferred way of working towards them.

Flexibility

Qualitative themes looked at the influence of a structured TBI format (*3, 10*); whilst some structure is useful for making therapeutic work manageable and increasing feelings of control, users also highly value the option to choose the modules or tasks they engage with. This could enhance a sense of a therapeutic connection with the TBI.

Technology features

The use of alerts and reminders could help people continue working towards their goals (*3*). Participants that related to the characters used in the TBI and liked the narrator of the program tended to have higher alliance scores (*5*). Similarly, the use of avatars to represent the program writers were well-received, and led participants to feel encouraged and supported (*10*). However, TBIs could also overdo this; when the TBI verbalised spoken responses in an attempt to convey empathy, this was universally poorly received (*4*) and was unsuccessful in establishing a bond. Empathy is important, but it seems that technology should not try to entirely impersonate humans to establish a bond, since this is not experienced as genuine. The use of multimedia (for example, music and writing) helped the program to be engaging (*10*), which is notable considering that people who rated a TBI as "boring"

Table 3: Factors examined for their influence on the human-technology relationship

Paper code	TBI Characteristics					User Characteristics			Other	
	Tailoring	Flexibility	Technology features	Credibility	Privacy	Completer status	Users' mental health	Alexithymia	Change over time	Relationship with therapist
1.	✓									
2.						✓			✓	
3.		✓	✓							
4.			✓		✓					
5.			✓			✓			✓	✓
6.										
7.										✓
8.								✓		
9.										
10.		✓	✓	✓	✓		✓			
11.										
12.										
13.										

exhibited a weaker alliance (*5*). Offering a choice of platform, such as desktop or mobile application, was also valuable (*3*).

Privacy

Qualitative themes illustrated the relevance of privacy when establishing trust with a TBI; working through one's problems using digital technology could lead to an enhanced sense of anonymity and not being judged (*4*), but there were also worries about confidentiality when inputting personal data.

Credibility

The importance of credibility was demonstrated (*10*), which was facilitated when the research that contributed towards TBI development was made apparent. Taking the findings related to privacy and credibility together, it is clear that a sense of security when using a TBI is involved in developing a trusting alliance.

Whilst there was a wide range of factors covered by the included papers, it remains notable that many papers did not investigate the role of TBI characteristics in influencing the alliance.

3.4.5.2 User characteristics

Generally, there were very few investigations on participant characteristics that facilitated or hindered the user-TBI alliance's development.

Completer status

Interestingly, alliance levels did not differ in people that completed a TBI treatment course versus those that did not (*2, 5*).

Users' mental health

Qualitative data indicated that very low mood could make participating in computerised self-help challenging and overwhelming (*10*).

Alexithymia

Difficulties identifying emotions did not hamper users' abilities to establish an alliance with a TBI (*8*).

3.4.5.3 Other factors

Change in alliance over time

Two papers (*2, 5*) examined the stability of alliance ratings during TBI treatment. Confidence in the program increased over time. Alliance dimensions relating to "partnership", "goal", and "task" remained stable over time; a sense that the user and TBI were working towards the same goals and in the same way was maintained over the treatment. Perceptions of a bond remained stable in one paper (*2*), but declined in the other (*5*).

Relationship with a human therapist

In one paper, a sense of therapeutic bond with a TBI was unrelated to the bond with a counsellor (*5*), although there was some association with the goals and tasks subscales. The other paper (*7*) found that TBI alliance scores had large correlations with therapist alliance scores. Individual questionnaire items were all correlated, with the exception of two items relating to goal-setting.

The two studies used different technology in their TBIs; a computer program (*5*) and virtual/augmented reality (*7*). Given that the virtual reality required more of a physical presence of a therapist (for example, setting participants up with the equipment), it might be that alliance with a TBI and a human therapist is more strongly connected in this scenario. Furthermore, satisfaction with a counsellor was not associated with TBI alliance ratings, the reasons for this being unclear (*5*). It at least appears that having a therapeutic alliance with a TBI is not detrimental to the relationship with a human therapist.

3.4.6 Which measures have been used to assess the human-technology relationship within TBIs?

All papers (except *10*) used a questionnaire to assess the therapeutic alliance between their sample and the TBI they used.

Most popular were adaptations of the Working Alliance Inventory (WAI): i) 36-item full WAI (Horvath & Greenberg, 1989 - 5, 6, 8, 13); ii) briefer 12-item WAI Short Form (WAI-S; Tracey & Kokotovic, 1989 - 7) or WAI Short Revised (WAI-SR; Hatcher & Gillaspy, 2006 - 1, 11, 12).

All papers that used a WAI version adapted the goal and task subscales, replacing "clinician" with words like "computer program". Two papers (*1, 12*) did not adapt the bond items to the TBI, and instead the subscale continued to refer to the therapist. Half of the papers reported internal consistency for the adapted scales using Cronbach's alpha (*1, 5, 7, 11*). Alpha values for the overall working alliance score ranged from .84-.92; goal subscale ranged from .70-.78; task subscale ranged from .84-.92; and the bond subscale ranged from .78-.86. These values cover papers using range of TBI formats and generally indicate a strong level of internal consistency for TBI-adapted versions of the WAI.

The second most popular measure was the 28-item Agnew Relationship Measure (ARM; Agnew-Davies et al., 1998), which was adapted by 3 papers (*2, 3, 9*).

Adaptations were similar to the WAI, e.g. "therapist" was replaced with words that referred to the technology (such as "computerised therapist"). Only one paper reported the Cronbach's alpha for the total ARM scale score, which was .87 (*9*). The range of alpha scores reported for the individual subscales were generally reasonable: Confidence: α=.68-.86; Openness: α=.56-.74; Partnership: α=.59-.76; Bond: α=.74-.82. However, all three papers reported issues with the Initiative subscale; it was either omitted entirely from analyses (*2*), and where papers did report alpha, it was poor (.26-.30 – *3, 9*).

The other questionnaire measure used was the 17-item Session Impacts Scale (SIS; Elliott & Wexler, 1994), adapted for computerised CBT (*4*). The SIS has a subscale dedicated to the therapeutic relationship, which was adapted by removing words like "therapist". Cronbach's alpha was not reported.

3.4.7 Does the human-technology relationship predict TBI outcomes?

Investigations of the association between the therapeutic alliance and outcomes were also part of the framework synthesis. See Table 4 for an overview of which variables or themes were investigated by each paper, and see Appendix L for the data within this framework structure.

3.4.7.1 Clinical outcomes

Alliance and outcomes such as anxiety, depression, stress, substance use, and functioning were not associated generally (*1, 3, 5, 9, 11*).

Some exceptions were found (*1, 7, 12*). Task and goal scores were associated with better stress and anxiety outcomes (*12*). In a study of virtual/augmented reality treatment (*7*), alliance levels were higher in those that improved or recovered, than those who did not.

In another paper, alliance was sometimes associated with anxiety symptoms in the standardised version of the TBI, but never in the tailored version (*1*).

3.4.7.2 Treatment satisfaction

TBI alliance scores were found to be strongly related to participants' satisfaction with treatment in one paper (*12*) but not another (*5*), although alliance *was* related to attributions of change (i.e. those with higher alliance scores were more likely to attribute change to the TBI; *5*).

Table 4: Papers that examined treatment outcomes and engagement

	Clinical outcomes	Treatment satisfaction	Engagement
1. Berger et al. 2014	✓		
2. Berman et al. 2014			
3. Clarke et al. 2016	✓		✓
4. Gega et al. 2014			
5. Kiluk et al. 2014	✓	✓	✓
6. Kiluk et al. 2016			
7. Miragall et al. 2015	✓		
8. Morie et al. 2015			
9. Ormrod et al. 2010	✓		
10. Purves & Dutton 2013			
11. Richards et al. 2013	✓		
12. Scherer et al. 2016	✓	✓	
13. Serowik et al. 2014			

3.4.7.3 Program engagement

Generally speaking, higher therapeutic alliance ratings were associated with greater engagement. People were more likely to engage in self-monitoring within the intervention with high alliance ratings, across dimensions of the ARM (*3*). Similarly, bond and goal scores were associated with the number of sessions completed (*5*).

In contrast, user-TBI alliance was not associated with the number of sessions completed with a counsellor (*5*). It appears that alliance with a TBI may make a difference to engagement with a TBI, but does not influence engagement with other treatment components.

3.4.8 Quality assessment

The quality of the included papers was variable, but generally quite low (see Table 1, and also Appendix J for full quality scoring information). In papers reporting qualitative data, there was often little discussion provided regarding the researchers' influence on the study process. Without an understanding of the study team's prior experience or assumptions on the topic area, for example, it is difficult to judge how these assumptions may have influenced the way participants were interviewed about their relationship with the TBI they used. The MMAT also highlighted frequent issues with sample representativeness across the included papers; there was often a high level of participant drop-out, and many participants were recruited into studies via self-referral. This is important for our understanding of the human-TBI relationship, as those dropping out of studies may have had vastly different alliance experiences.

3.5 Discussion

3.5.1 Results summary

This review aimed to provide an understanding of the relationship between human and digital technology in TBIs for mental health problems, particularly the relevance of the therapeutic alliance. Whilst components of working alliance theory appear to remain valid in TBIs, there were added alliance dimensions relevant to the user-TBI relationship. Characteristics of the TBI were found to impact on this alliance, but less research has focused on the influence of client characteristics. Adapted versions of the WAI and ARM were the most popular measures for

assessing alliance. Clinical outcomes were generally not associated with the alliance in TBIs. There were conflicting findings regarding treatment satisfaction, but the alliance was often associated with engagement with TBIs.

3.5.2 Therapeutic alliance in TBIs

It seems that people *can* develop a "working alliance" with a TBI, as the agreement upon the goals and tasks of therapy remained relevant, as did feeling supported and encouraged. TBI developers should therefore continue with efforts to create sophisticated TBIs which allow for a high degree of personalisation. The possibility for real-time engagement with smartphone interventions, the incorporation of data from a smartphone's automatic sensors, and the connection of wearable devices to smartphone applications (Donker et al., 2013; Gravenhorst et al., 2014) are all possibilities for future development of personalised TBIs.

Both qualitative and quantitative data indicated participants' development of a "therapeutic bond" with the technology itself, despite concerns over the role of the therapeutic relationship in TBIs (Fleming & Merry, 2013; Stallard et al., 2010). It is unclear whether people are comfortable with framing their experiences with a TBI in terms of a "relationship", as studies show people are hesitant to consider their phone or computer using such terminology (for example Lupton & Noble, 1997; Wang, 2017).

At least in this early stage of the field, the concept of "client initiative" may not be valid for TBIs, given the poor psychometric properties reported. This dimension may simply not be as relevant to a user-TBI alliance, since TBI treatment is mostly self-guided by nature and thus people using TBIs may *expect* to set the treatment's direction. Alternatively, there may be issues with the "client initiative" subscale in general; low alpha values were reported even in the ARM development paper (Agnew-Davies et al., 1998).

The other ARM factors of "openness" and "confidence" require further investigation. Whilst the relevance of these factors appears intuitive, their contribution to alliance in TBIs is uncertain. For instance, the sense of privacy in TBIs may also be experienced as isolating (Knowles et al., 2014). The new alliance factors "availability" and "interactivity" are also interesting, as they are not covered by existing models of the therapeutic alliance. Participants noted the significance of

inputting data into a TBI, resulting in personalised feedback. This may replicate features of a human relationship, that can respond flexibly to an individual's experiences. However, this provision of feedback could present an additional source of pressure on the user. Future research should explore the role of interactivity and availability in detail, to examine when this might be beneficial or harmful.

3.5.3 Alliance and outcomes

The lack of relation between alliance and TBI outcome is in stark contrast to face-to-face treatment research (Horvath et al., 2011; Martin et al., 2000). Some authors have commented that the alliance may be less important for TBI outcomes, and that other factors underlie treatment success (Ormrod, Kennedy, Scott, & Cavanagh, 2010). Alternatively, these null findings could arise from measurement issues; by using adaptations of face-to-face alliance measures, some relationship variables present in TBIs may not have been fully captured (Clarke et al. 2016). Whilst some of these alliance variables do appear to retain validity in TBIs, their current measurement may be suboptimal and other TBI-specific dimensions may be omitted from existing therapeutic alliance measures.

However, Miragall, Baños, Cebolla, and Botella (2015) did find a link between alliance quality and the outcomes of virtual/augmented reality therapy, and it is possible that alliance levels matter more in virtual/augmented reality therapy. Since a therapist has more of a physical presence in virtual/augmented reality than other TBI formats, the users' alliance with the virtual environment and therapist may overlap. Correlations were indeed found between the two alliances, although the alliance with the virtual environment did contribute some variance towards treatment outcomes independently of the therapist alliance.

Despite the findings relating to clinical outcomes, the therapeutic alliance does seem to play a strong role in treatment engagement. The user-TBI alliance was associated with engagement indexed by frequent log-ins and modules completed. In one paper (Clarke et al., 2016), the "emotional connection" (composite score of bond, partnership and confidence) score was related to program log-ins and modules undertaken; perhaps the strong sense of an emotional connection was the only variable sufficient to encourage people to engage on this level, and perceptions of empowerment (client initiative) and non-judgement (openness) were insufficient.

Alliance may influence TBI outcome indirectly, via its association with engagement. Brown, Mountford, and Waller (2013) have suggested that therapeutic alliance may be more crucial for engagement in treatment rather than having a substantial, direct impact upon outcomes. Further research is needed to explore whether this is the case in TBIs.

3.5.4 Future research

As noted above, TBI alliance dimensions may differ from those in face-to-face therapy (Clarke et al., 2016). A useful next step would be to develop questionnaire items for the new dimensions of "interactivity" and "availability" as part of a new therapeutic alliance measure specifically for TBIs, which could also include some of the adapted WAI/ARM items. All of these items could be given to a large sample of TBI users to examine their underlying factor structure and psychometric qualities. A new measure may help to answer questions about whether the current failure to find a consistent alliance-outcome link is due to alliance measurement issues. Ideally, future studies on the user-TBI alliance should make use of methods which allow conclusions to be drawn about causality, such as the instrumental variable methods used by Goldsmith et al. (2015) to explore therapeutic alliance in psychosis treatment.

Only one paper in the review (Clarke et al., 2016) studied a TBI that was accessible via smartphone. A greater exploration of the therapeutic alliance in smartphone-delivered TBIs would be valuable, due to the potential for smartphones to be accessed by a user across a range of situations (Donker et al., 2013; Ramsey, 2015), their highly customised nature (Wang, 2017), and the potential use of smartphone sensor data (Donker et al., 2013; Gravenhorst et al., 2014).

Much more research is needed on user characteristics that influence their alliance quality with a TBI, the few studies to date did not explore factors such as personality characteristics and comfort with digital technology which could influence user-TBI alliance strength. For example, people that highly value privacy may build up a stronger therapeutic alliance due to the more anonymous nature of a TBI.

3.5.5 Limitations

The small sample sizes of many of the included papers limit the ability to make firm conclusions about the nature of the human-technology relationship in TBIs at present. Moreover, high levels of dropout from the studies identified during quality assessment indicate issues that may have impacted on findings with respect to TBI outcomes. High dropout rates have been frequently identified in TBI studies (Richards & Richardson, 2012); this is a problem for alliance research, as the experiences of those dropping out from TBIs are likely to greatly differ from those that do not drop out.

Relatedly, the low quality of many of the included papers has implications for the confidence with which this review's conclusions can be drawn. With all evidence taken together, it appeared that alliance and outcomes were generally not associated (in contrast to face-to-face therapy). The studies examining alliance and outcomes were often not high quality (5 out of 7 papers received scores of 25% on the MMAT); common issues identified across these papers pertained to high dropout levels, incomplete outcome data, and differences between groups not being accounted for. Might the failure to find a relationship between alliance quality and TBI outcomes be due to these methodological issues? However, when examining the two higher quality papers (Berger et al., 2014; Kiluk et al., 2014), there remained limited evidence of an alliance-outcome link. There is a need to do further high quality research on the association between alliance and TBI outcomes, to determine whether the lack of association found so far is an artefact of methodological issues.

It was not feasible to conduct a meta-analysis, due to the high level of heterogeneity across studies. However, the value of synthesising qualitative and quantitative research should not be understated; omitting qualitative papers would not have allowed for the identification of two potentially new dimensions of the user-TBI alliance.

There was variety in the detail provided by the included papers pertaining to the exact components and features of the TBI. Problems in the reporting of online treatment approaches have been identified (Eysenbach & Consort E-Health Group, 2011). As there is likely to be a role for certain components in influencing the alliance quality, this lack of detail makes it very difficult to make judgements

regarding features that promote alliance. Several included papers provided many details on the TBI; for example, Berger et al. (2014) described module content, the support provided, information security steps taken, and how tailoring was achieved. Future research would benefit from the reporting of TBIs in more detail, perhaps by following the guidelines of checklists such as CONSORT-EHEALTH (Eysenbach & Consort E-Health Group, 2011) or Enlight (Baumel et al., 2017). Attempts to study which components are successful in promoting an alliance would be welcomed, as few studies have previously done this.

Additionally, as the search terms targeted a clinical context, conclusions about therapeutic alliance in terms of general wellbeing or mental health *improvement* (as opposed to treating a clinical problem) for TBIs cannot currently be drawn. This could be interesting for future research on online positive psychology interventions.

3.5.6 Conclusion

It appears that the working alliance theory of Bordin (1979) does remain relevant in TBIs, but there may be other aspects of the alliance in TBIs that are not covered by this formulation. There is a great need for further research in the subject area, which could start by developing a new measurement of therapeutic alliance with a TBI. Further qualitative research that specifically examines therapeutic alliance experiences in TBIs would also be highly valuable.

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Exploring users' engagement and therapeutic alliance with technology-based interventions for mental health problems: A qualitative interview study

4.1 Abstract

Background: "Technology-based interventions" (TBIs) are a form of self-guided psychological treatment delivered by digital technology, such as computer programs, websites, or smartphone applications. This treatment format can be effective, but little is known about users' experiences of engaging with TBIs, or the role of the therapeutic alliance.

Objective: To investigate users' interaction and engagement with TBIs, and whether the therapeutic alliance remains a valid and useful concept in this treatment context.

Methods: Topic-guided, qualitative interviews were conducted with 13 participants with a variety of clinical issues, including depression, anxiety, and bipolar disorder. Participants had used a range of TBIs, with heterogeneity with respect to format, digital technology used to deliver the treatment, theoretical approach, and number of modules. Thematic analysis was used to analyse the data.

Results: Qualitative themes indicated the importance of a sense of mutual understanding between the user and TBI, as well as trust and perceptions of the TBI as friendly and compassionate. Crucial for engagement was the user's level of control over the way they used the TBI, and the ability to personalise the TBI to their own needs and circumstances. However, participants were generally not comfortable to frame their interaction with the TBI as a "relationship", and viewed the TBI more as a tool, or in terms of its functionality. The notion of having a "relationship" with a TBI was seen as possible if a TBI involved a level of "intelligent" and responsive design.

Conclusions: Engagement with TBIs can be facilitated with a high degree of user control and personalisation. The qualitative themes indicate the theoretical possibility of developing a therapeutic alliance with a TBI itself, but this depends significantly on the ability of the technology to adapt its content in response to its users' needs.

4.2 Introduction

Psychological treatment can be provided via digital technology; this delivery method is often self-guided, and typically involves psychoeducational material, interactive online tasks, and the teaching of behaviour change techniques or coping strategies in a modular format (Barak et al., 2009).

There is evidence to suggest that technology-based interventions (TBI; Kiluk et al., 2014) can be effective. Systematic reviews and meta-analyses of computerised and online mental health treatment have found evidence of effectiveness for depression and anxiety (Andersson & Cuijpers, 2009; Davies, Morriss, & Glazebrook, 2014; Richards & Richardson, 2012) and a range of psychiatric and somatic disorders (Andersson, Cuijpers, Carlbring, Riper, & Hedman, 2014). Evidence also suggests that online interventions for bipolar disorder may improve users' quality of life and wellbeing (Murray et al., 2015; Todd, Jones, Hart, & Lobban, 2014).

Delivery of a TBI via smartphone may be particularly convenient, since a mobile platform can provide real-time, real-context management of users' mental health (for example, Ben-Zeev, Kaiser, & Krzos, 2014). Systematic reviews have concluded that smartphone applications have the potential to provide effective and acceptable mental health care (Alvarez-Jimenez et al., 2014; Donker et al., 2013). As two thirds of adults own smartphones (Ofcom, 2015), the consideration of the smartphone's role in mental health is particularly timely.

Although TBIs can be effective in reducing symptoms, the underlying processes and mechanisms of change need to be investigated (Andrews et al., 2010). Indeed, much of the research about online approaches to treatment focuses primarily on clinical outcomes, and by comparison, the therapeutic processes involved in self-guided treatments remain thoroughly under-researched (Purves & Dutton, 2013). Particularly concerning is the high drop-out rate seen in TBI usage; Karyotaki et al.'s (2015) systematic review of self-guided, online mental health treatments showed that adherence can be lower than 20%.

Whilst research indicates that TBIs featuring support from a clinician or an administrator suffer less from drop-out rates (Richards & Richardson, 2012), full treatment adherence can still be very low (for example, Kenter et al., 2013). This

research study aims to provide an understanding which features of TBIs promote engagement and interaction, using the framework of the "therapeutic alliance".

In face-to-face treatments, the therapeutic alliance has frequently been conceptualised as a collaborative relationship between therapist and client, in which there is agreement upon the goals and tasks of therapy, as well as the presence of a high quality interpersonal bond (Bordin, 1979). The strength of the therapeutic alliance is consistently found to predict and correlate with the outcomes of face-to-face psychological therapies (Horvath et al., 2011), and recent research supports the notion of a causal relationship between alliance and outcome (Goldsmith et al., 2015). The therapeutic alliance is posited to be a pantheoretical construct, that may apply across any type of helping relationship or theoretical orientation of treatment (Horvath, 2006).

However, less is known about the potential role of an alliance between the user and a TBI, as opposed to a human therapist. The majority of studies in this field have used adapted versions of therapeutic alliance measures that were originally developed for a face-to-face context (for example, Berger et al., 2014; Clarke et al., 2016; Kiluk et al., 2014). In contrast to studies of the therapeutic alliance in face-to-face treatment, there are often few associations found between treatment outcomes and therapeutic alliance quality with a TBI (for example, Clarke et al., 2016; Kiluk et al., 2014; Ormrod et al., 2010). It could be the case that therapeutic alliance or engagement with TBIs is comprised of different components, which are specific to a technology-based context, which measures based in face-to-face settings do not fully capture (Clarke et al., 2016). It is therefore crucial that qualitative, exploratory work is done to examine users' experiences, to shed some light on the form that the alliance might take in a TBI context.

There has been a small amount of previous qualitative research on the therapeutic alliance in TBIs. For example, a qualitative analysis of computerised cognitive behavioural therapy (CBT) content found evidence of therapeutic alliance features, such as conveying warmth and being responsive to user requirements (Barazzone et al., 2012). Clarke et al. (2016) conducted a qualitative interview study investigating the therapeutic alliance with a self-guided TBI aimed at alleviating depression and anxiety, which was accessed on the web or via smartphone. They

found that alliance-relevant concepts were present in a user's interaction with the TBI; for example, the program could be seen as expressing empathy and acceptance, and as working collaboratively with the user to meet their individual needs. Additionally, Baumel et al. (2017) found that e-health interventions that scored highly for exhibiting therapeutic alliance features also scored well in terms of user engagement. It therefore seems possible that the therapeutic alliance can remain a relevant concept in therapies which may not have an active role for a human therapist.

The present qualitative study aims to deepen our understanding of the alliance in TBIs, and add to existing knowledge in several ways. Firstly, this study has recruited participants with a range of different problems that have accessed different types of TBIs. This is important because the therapeutic alliance has long been considered to be a transtheoretical concept that applies across different types of therapy (Horvath, 2006). It would be valuable to examine whether this appears to be the case in the experiences of TBI users.

The inclusion of people that used smartphone-based TBIs in this project is also key, as alliance experiences may be impacted upon by the device used to access a TBI. As Wang (2017) notes, smartphones are portable and travel with the user, and initiate interactions more proactively using features such as notifications. Furthermore, the smartphone experience is often highly personalised due to the increased opportunity for users to customise smartphone applications (Wang, 2017). As such, alliance experiences in those that accessed a TBI via smartphone should be investigated.

Lastly, the present paper also explores the acceptability of alliance-related terminology to users of TBIs. In these interviews, participants were asked directly whether they viewed themselves as having, for example, a "relationship" with the TBI they used. Do people see themselves as having a therapeutic relationship with a piece of digital technology? Does this terminology make sense to people, or does it feel inappropriate or strange? To our knowledge, this has not been done in any other study of the therapeutic alliance in TBIs using qualitative methods. It is important to establish whether such concepts retain face validity in therapeutic contexts which may not involve a human therapist as the primary facilitator of treatment.

Therefore, this research investigates users' interaction and engagement with technology-based treatments, and considers whether the therapeutic alliance remains a valid and useful concept within the context of TBIs. Much primary research on the therapeutic alliance within psychosocial interventions has been conducted using quantitative measurements of the alliance. However, relatively brief measures may not always be able to detect key features of the alliance in therapeutic situations (Hatcher & Barends, 2006). It is hoped that this qualitative research will enable a deeper understanding of how TBIs work from users' perspectives, how features of TBIs can support users to engage with the technology, and ultimately lead to more effective and engaging mental health treatment.

4.3 Methods

4.3.1 Design

Topic-guided interviews were used to collect detailed qualitative data regarding participants' engagement with TBIs for mental health problems, which were analysed using thematic analysis. The project received ethical approval from Lancaster University (sponsors of the study) and from the NHS (NRES Committee London – Hampstead; REC reference: 15/LO/1619).

4.3.2 Participants and recruitment

Participants were eligible if they had used TBIs for a mental health problem within a clinical setting in the last 6 months, were aged 16 or above, and had capacity to consent to take part. TBIs were more specifically defined as:

- Mainly accessed on a self-help/self-guided basis, although it was acceptable to have received some human support to use the intervention (maximum 1.5 hours over the treatment's duration; Glasgow & Rosen, 1978; Newman, Szkodny, Llera, & Przeworski, 2011). Interventions in which interpersonal contact from a therapist forms the main part of therapy (for example, therapy via email or videoconferencing) were ineligible.
- Be intended for individual usage (as opposed to a family-focused intervention).
- The intervention must primarily focus upon mental health change, in a clinically significant context (not physical health or general wellbeing).

- Whilst CBT-based TBIs are the most common, any theoretical approach was acceptable.
- Must be technology-delivered (for example, accessed via a computer program, CD-ROM, website or smartphone application).

Recruitment took place in several NHS trusts in North West England and a third sector service that offered TBIs as a treatment option. When potential participants expressed interest in the study, the researcher (LH) discussed with them the type of service they used and their self-reported clinical diagnosis, to ascertain their eligibility.

Participants were offered a £10 voucher, as a way of thanking them for their time, and reimbursement for reasonable travel expenses. A total of 13 participants were recruited. All participants that were consented into the study completed the interview, except one that dropped out halfway through an email interview.

4.3.3 Procedure and data collection

This study involved qualitative, topic-guided interviews to allow for flexibility within individual interview situations and participants (Scheibelhofer, 2008). See Appendices F and G for full and brief versions of the topic guides. Input on the content and wording of questions in the topic guide was received from a service user advisory panel at the host research centre. Interviews were conducted by the Chief Investigator (LH), a postgraduate health research student.

The questions asked towards the beginning of the interview were intended to be more open and general with regard to participants' experiences. More direct questions pertaining to therapeutic alliance experiences were usually not asked until towards the end of the interview. This was because the research team were wary of biasing a person's description of their experiences by using alliance-relevant terminology early on in the interview. A key aim of the interview was exploring the acceptability of certain terminology when describing a human-technology interaction, and part of this was an interest in whether participants would spontaneously use terms that are more commonly associated with interactions between humans (for example: "connection" or "relationship").

Participants were offered a choice of delivery format for their interview, either via phone, face-to-face, or email. Participants were informed that phone or face-to-face interviews were expected to last up to one hour on average. Only one participant opted for face-to-face, and this lasted just over 30 minutes. Nine participants opted for telephone interviews, and the mean length of these was 45 minutes, 25 seconds (range: 27:40 – 01:14:25). Face-to-face and phone interviews were audio-recorded.

With regard to email interviews, participants were informed that these were likely to last several hours due to their written format. Interview questions were sent in a password-protected document attached via email, which the interviewee completed and returned to the researcher (also password-protected). Follow-up emails were sent as reminders or to offer assistance when necessary. Three participants had their interview by email; of these, two interviews involved five email exchanges (to participants and back from participants), and one interview involved 4 emails sent and 3 returned (the participant dropped out midway through the interview). In each exchange, the researcher sent 3-4 new interview questions, along with follow-up remarks on a participant's previous response. The average (mode) number of questions sent to a participant in each email was 4 (median = 4.5; mean = 5.14; range 4-7).

A reflective diary was kept by the main analyst (LH), with the purpose of keeping track of developing thoughts about analysis, potential biases and influences upon the data, and to improve upon the quality of interviews.

4.3.4 Analysis

The qualitative interview data was anonymised and transcribed (in the case of telephone or face-to-face interviews) by LH. A thematic analysis approach was used to analyse the interview data, following the recommended steps of Braun and Clarke (2006) Appendix I contains a table which details these steps. Thematic analysis is not at odds with the critical realist position of the study, which states that an external reality exists, but our ability to know it accurately is limited by the human senses and the inherent interpretive nature of investigation (Maxwell, 2012; Pernecky, 2016). Although thematic analysis is epistemologically flexible (Braun & Clarke, 2006),

thematic analysis was felt to suit critical realism since critical realism aims to identify "generative mechanisms" (Bhaskar, 1989) which are theoretical explanations for observed events. As this study aims to identify what can promote engagement or a sense of alliance with a TBI, using thematic analysis to identify common themes across participants' accounts was felt to be useful.

All transcripts were first read through several times to familiarise LH with the data. A list of initial codes was generated, which were systematically identified across the dataset. These codes were used to label any salient aspect of the participants' account, to address the research aims of exploring users' TBI experiences and to identify aspects of that experience (for example, technological features, or the situational context) that influenced their interactions with the program..

There were roles for both inductive and deductive logic in the analysis strategy. With regard to deduction, some codes were informed by existing theoretical constructs (such as therapeutic alliance dimensions; e.g. "goal setting"), and thus resembles "testing" an existing theory as per a deductive approach (Bryman, 2008). This choice was made because previously-outlined theories can provide a useful structure with which to explore unknown areas (Silverman, 2015). There was also a role for the inductive logic typically associated with qualitative research, in which a researcher starts with data collection, and then seeks patterns in data with which to build theory (Bryman, 2008). In this paper, this was used to code interesting aspects of participants' experiences which did not map onto therapeutic alliance elements. A thematic analysis rather than a framework analysis approach was used in this paper since the alliance in TBIs is such a new field, and an approach which allowed more for identifying codes outside an existing theoretical structure was felt to be valuable.

These codes were then sorted into overarching "themes", to begin a broader level of analysis. This was done by arranging the codes into conceptually similar groups, which were examined for the extent to which they addressed the research aims (i.e. identifying common threads across users' experiences, identifying features of TBIs which promote interaction or engagement, and the relation of these code groupings to therapeutic alliance dimensions). These themes were continually reviewed and refined through discussion among the research team, in order to

identify each theme's essential meaning. The analysis repeatedly moved backwards and forwards between the data and subsequent themes and interpretations, to ensure that the explanations remain consistent with the original data. The research team examined what each theme could tell us about users' interaction and engagement with TBIs, continually referring back to the study's original aims and research questions. Whilst much of the theme content can be related to therapeutic alliance theory, the themes were titled according to their core content, rather that being forcibly labelled in the terms of therapeutic alliance theory. This was done in the interest of remaining faithful to the data, but the themes are later interpreted in light of therapeutic alliance theory.

This team approach also ensured that any biases in interpretation of the data due to individual preconceptions could be identified and taken into account. Table 5 gives an example of this process, by illustrating the progression of analysis on an excerpt of text. NVivo 11 Pro (QSR International Ltd, 2017) was used to assist with analysis.

There were some attempts to reduce bias (e.g. keeping an analysis diary, checking preconceptions with wider team). This project was undertaken with a critical realist position, as outlined above, which acknowledges that meaning is co-constructed in context by researchers and participants (Blaikie, 2007; Silverman, 2015). Accordingly, the element of co-construction in participants' account is acknowledged, but there were attempts made to limit the risk of LH unduly influencing participants' accounts.

Table 5: Example of differing levels of analysis on a transcript

Transcript excerpt	Code	Subtheme	Theme
So the computer doesn't know me as a person, it's not judgemental. So that – I think that's quite a good thing. It's not judgemental, and I know counsellors are not judgemental but they're still a person and they're still human, and they've probably still got views, which they're entitled to. Computers don't have that.	Non-judgemental	Friendliness and compassion	A supportive, safe interaction

4.4 Results

Table 6 contains details of the sample's demographics and the TBIs that each participant accessed.

Participants ranged in age from 22-60 years old, with 7 women and 6 men. The most common clinical issues reported were depression, anxiety and bipolar disorder. The majority of participants ($n = 9$) participants accessed a TBI via official health services referral, sometimes instead of or whilst waiting for face-to-face treatment. Two participants came to use their TBIs via recommendations from support groups, and the other two found them on their own initiative.

The dataset was overwhelmingly rich in its coverage of peoples' experiences of using TBIs, and a huge range of experiences were expressed and discussed by participants. As a result, this paper focuses on four particularly salient themes, which illustrate the most novel and unexpected findings that add to knowledge regarding engagement with TBIs. The themes and subthemes covered in this paper are outlined in Table 7. The connections between themes and subthemes are outlined in Figure 2. Where participant quotes have used the name of the TBI they have used, this has been replaced simply with "TBI".

Table 6: Participant demographics and TBI details

	Age	Gender	Clinical Issue	TBI Description	Location of access	Level of support*
P101	45	Female	General distress	Website promoting wellbeing via creativity. No set number of sessions – used as often as the person likes.	Home	Face-to-face to access service, none after that.
P102	N/K	Female	Bipolar disorder & anxiety	Online CBT for anxiety and depression accessed via a website, 5 modules.	Home	None
P103	28	Male	Bipolar disorder & depression	Online CBT for stress, anxiety and depression accessed via a website, 8 weekly sessions.	Clinic	Face-to-face
P104	37	Female	Bipolar disorder & depression	Self-help website for bipolar disorder, 8 modules.	Home	None
P105	58	Female	Reactive depression, bereavement & trauma	Online CBT for stress, anxiety and depression accessed via a website, 8 weekly sessions.	Clinic	Face-to-face
P106	24	Male	Bipolar disorder & anxiety	Mobile apps for meditation. No set number of sessions - used as often as the person likes.	Home	None
P107	44	Female	Depression	Online CBT for anxiety and depression accessed via website and app, 8-10 weekly sessions.	Home	Telephone
P108	49	Female	Depression	Online CBT anxiety and depression accessed via website and app, 8-10 weekly sessions.	Home	Telephone
P109	22	Female	Anxiety	Online CBT anxiety and depression accessed via website, 8-10 weekly sessions.	Home	Telephone
P110	52	Male	Bipolar disorder & OCD	App for tracking and managing mood, used as often as the person likes.	Home	None
P111	N/K	Male	Anxiety & depression	Online CBT for anxiety and depression accessed via website, 8-10 weekly sessions.	Home	Telephone
P112	60	Male	Bipolar disorder	Website for tracking and managing mood, and a website aimed at reducing bipolar relapse.	Home	N/K
P113	N/K	Male	Anxiety	Online CBT for anxiety and depression accessed via website and app, 8-10 weekly sessions.	Home	Telephone

N/K: Not known, due to researcher error or information not provided by participant
*If there was human support as part of the TBI's delivery, this was always minimal, or provided in short sessions, in line with our inclusion criteria.

Table 7: Overview of themes and subthemes.

Theme	Subthemes
Mutual understanding	Does the TBI show understanding?
	Does the user understand the TBI?
A supportive, safe interaction	Friendliness and compassion
	Trust
Interactivity	User control
	Personalisation
Is it a relationship?	Objection to a human-technology "relationship"
	A "human face"
	Functionality
	Role of interactivity in the therapeutic relationship

Figure 2: Diagram illustrating the connections between themes and subthemes.
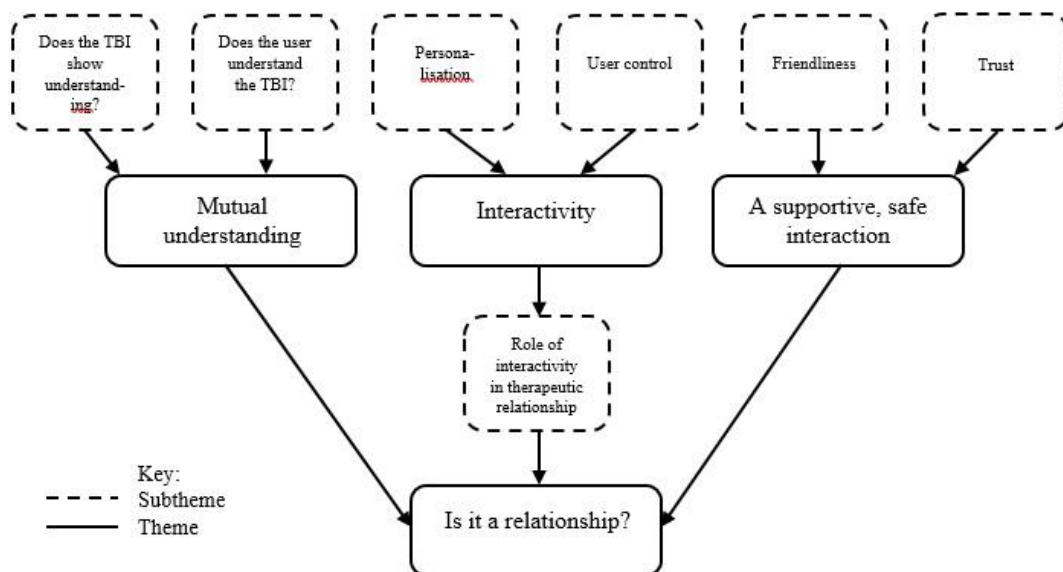
4.4.1 Theme: Mutual understanding

This subtheme incorporates the ways in which the user and TBI could come to a sense of understanding one another, the effect this had on the human-technology relationship, and the success of the treatment.

4.4.1.1 Subtheme: Does the TBI show understanding?

In nearly every interview, participants brought up the value of seeing their issues reflected back to them in the TBI content. This could be achieved by using relatable examples, scenarios, or others' experiences. Using such techniques provided an illustration of therapeutic concepts in real-life terms, and helped participants apply these to their own lives. Using case studies and examples helped participants step outside their own experiences, and feel less alone.

"The provision of other people's experiences showed an understanding in solidarity. So I didn't feel so isolated anymore. I think that shows a great deal of understanding" – P109

This was key to feeling understood, and those that didn't identify with the examples tended to feel they did not have a relationship with the TBI. To promote engagement it is therefore crucial to provide a range of scenarios and examples, so more users can relate to the program and feel accommodated by it. Interestingly, several participants noted the difference between the TBI understanding their clinical condition and the TBI understanding their individual circumstances. For some, this was a positive:

"The TBI knows nothing about me, other than the fact that I'm in a very low place (...) I would say that is quite a good thing, because I found it very difficult to talk about it when I was that low." – P105

By not having to input upsetting personal information, some were better able to engage with the treatment as there were fewer demands upon them. However, several noted the limitations of a TBI when it comes to understanding deeper or more traumatic issues, suggesting that a TBI alone may be unsuitable for more severe mental health issues. For some, only a human-led therapy is appropriate for tackling the root causes of their issues or for support through particularly upsetting experiences. In addition, participants often cited human support as crucial to their understanding of the TBI. A human supporter helped participants to apply the TBI's techniques to their lives:

"The telephone sessions every alternate week to discuss the module I had completed really helped me to cement these practices into my everyday living, like I could voice

my opinions and insecurities and be completely understood and not feel like I was
totally alone in how I was feeling." – P109

4.4.1.2 Subtheme: Does the user understand the TBI?

Users must be able to understand the content, treatment rationale, and navigate the system easily. One method that TBIs used to achieve this was by presenting information in manageable chunks. If the program was too overwhelming to use from the start, participants became discouraged and a user-TBI relationship was not established. When the information was presented in manageable pieces, users could access the TBI at their own pace. This was particularly important for participants using the TBI in an active state of mental ill health, such as depression:

"Sometimes people need things broken down into steps to allow them to understand or so it doesn't seem overwhelming." – P101

Providing explanations of the treatment process was another way that user understanding of the TBI was facilitated. Establishing treatment rationale appears to be as important in a TBI setting as in a face-to-face approach. Service users could participate more actively in treatment, and were able to apply the techniques with an understanding of why certain information was provided. When this didn't happen, participants experienced frustration.

"It would be good for them to have some more explanation of the sort of the principles of the things that they're going through. (…) So ok why am I doing this? Sometimes if you're stressed and then you've got a little recording asking you to weird stuff, you're like "well now you're annoying me"." – P106

4.4.2 Theme: A supportive, safe interaction

4.4.2.1 Subtheme: Friendliness and compassion

Participants frequently stated the importance of the technology coming across as friendly, compassionate and with a positive tone. Tasks that were positive in nature could boost users' mood, and help them to feel more optimistic, hopeful and uplifted:

"The whole site is designed to make you feel good, so the things it gets you thinking about, they're always positive or nice (...). So every single activity is designed to make you feel better and stronger" – P101

Although participants were often using TBIs for serious issues, it was often suggested that a sense of fun could facilitate engagement. Undertaking fun activities as part of the TBI could help to foster transferable coping skills to be used in other areas of the participant's life. Unsurprisingly, when tasks were perceived as tedious, participants were less likely to complete them, and often suggested ways that the TBI could become less dull.

"I'd like some entertainment, you know what I mean? I'd like something to come back and say something fun, (...) maybe something to keep me interested" – P111

Crucially, it may be beneficial for TBIs to be framed positively, rather than focusing excessively on negative mental health experiences. When TBIs demonstrated empathy and understanding towards their users, participants felt more comfortable during treatment and were more likely to engage in therapeutic tasks.

"He [clinician providing TBI's voiceover] gave the impression that you were both working on it together (...) I felt quite positive because he's broken everything down, and he's explained certain things (...), and then he's given you a couple of minutes to just get your thoughts in order" – P103

A sense of TBIs as being potentially less judgemental than humans indicates that technology's perceived lack of personal views and attitudes could influence user engagement. When participants felt they weren't being judged, they were able to be more open and honest, and could tackle their issues more directly. This is particularly interesting given the above findings which indicate the positive aspects of the technology behaving in a human-like fashion (i.e. by being friendly), as there were also benefits of the inherently impersonal behaviour of technology. By interacting with technology rather than another person, there was a sense of added privacy.

"I know counsellors are not judgemental but they're still a person and they're still human, and they've probably still got views, which they're entitled to. Computers don't have that. (...) I felt safe, and completely unexposed." - P105

4.4.2.2 Subtheme: Trust

It was also paramount that users could build trust with the TBI, by feeling secure whilst using TBIs and perceiving the TBI as credible. Particularly important was a feeling of privacy, for example:

"You were looking at your screen, you were going at your pace, and you had headphones on which isolated you. (…) I wouldn't have liked it if it had been, for instance, a group therapy thing, because I would have felt more embarrassed. I would have felt exposed." – P105

Shame, embarrassment and stigma was often reduced, as others might be entirely unaware of the participants' TBI use. A lack of privacy in public spaces sometimes made it difficult to engage with the TBI. However, participants often deployed creative strategies to overcome these barriers, which could be situational or by using features of the technology:

"I just put my headphones in, put sunglasses on so I could close my eyes behind those and no one would know, and listen to my TBI app" – P106

"I liked that the app has an added security feature of fingerprint recognition on use" – P113

It's important to note the potential limitations of some of these strategies. They may be much easier to undertake if the TBI is accessed via a mobile application owing to their small size and portability, when compared to accessing a TBI on a laptop or desktop computer. The perception of privacy risks could contribute to a sense of technology as being less trustworthy than another person; being able to mitigate against these increased risks was a suggestion for developing trust:

"I think a website lacks the personal touch which makes you be able to build up trust. One way maybe would use password-protected documents to make you feel your information was secure." – P107

Developing trust with the TBI also involved users' perception of the TBI's credibility as a viable treatment option. There were multiple ways that credibility

was perceived; this could be achieved by the TBI itself (for example, by consistency in the materials), or owing to a credible referral source:

"I heard about it through [mental health charity] which is like the number one support group (...) it made me feel more confident that I can trust it." – P104

Perceptions of a low credibility presented a major barrier to engagement with the TBI. If it appeared that the input of appropriate experts had not been considered during development, perceptions of the quality and usefulness of the TBI suffered.

"I don't know whether it's educationists that have actually built the program, but it should be. (...) and also people who are good at technology. (...) You'd have a better quality product, you'd be looking more at innovative ways of education, getting people to see things, other than the very flat way of interacting." – P102

4.4.3 Theme: Interactivity

The key message from this theme is the importance of user control over TBI usage, as well as how much and the type of information they can input. Giving users more control over treatment delivery appears to be empowering, more engaging, and potentially more effective.

4.4.3.1 Subtheme: User control

The amount of control felt over how participants used the TBI was noteworthy, as the degree to which participants could choose when they engaged with the TBI arose as significant in nearly every interview:

"You don't want heavy information. It lets you come back at your own time, and videos and just pause." – P104

Using the TBI at a convenient time allowed for engagement when it was most helpful, or when users were in a suitable state of mental health. Sometimes, it was possible to complete only a small task within the TBI. Participants could avoid feeling overwhelmed by a large amount of content, and being put off from doing anything at all. Conversely, the flexibility in timing offered by some TBIs could lead to therapeutic work not being done, as life's other demands could more easily present an obstacle without a definitive time set to engage with the intervention.

"I don't think I would want to do something like that again, because I think what I found is that I wasn't very disciplined, I didn't always give myself the right time to do it." – P108

Control was not limited to choosing the time at which they used the TBI. For example, some users could select tasks that matched their mood at that particular time, or they could skip optional tasks that did not meet their needs:

"Depending on what your mood is or how you're feeling that day, you can choose activities to help with that, or just find one that you feel like doing that appeals to you." – P101

This shows the importance of giving TBI users choice and control. When people can tailor the TBI to meet their individual needs, it may make it more likely that someone engages with the technology. Other ways in which users suggested engagement could be improved would be to offer different levels of task difficulty depending on the user's level of expertise, and allow them to have control over selecting the appropriate level.

"It would be good if they had something for beginners. Like beginners, intermediate, and advanced. It's very hard to get into mindfulness at first. To switch your brain for something so it would be good if they had like a beginner's one as well" – P110

4.4.3.2 Subtheme: Personalisation

Participants also discussed tailoring the TBI towards their individual circumstances. For instance, participants could use tools within the TBI to set manageable goals and plans for their own needs. These features supported engagement with the TBI by helping the user to apply what they learned into their own situations. For example:

"The good thing about it as well is it gives you a chance to sort of make plans. So you've got the four step plans (...) It's about having a goal, but it's about sort of having sort of realistic achievable goals." - P103

TBIs differed in their capacity to cater to varied issues, and their ability to provide appropriate tasks depending on the participants' goal. Discussions around this issue seemed relevant to one of the core factors of working alliance theory; the

notion of "task agreement", or the extent to which the client and therapist agree on therapeutic tasks that should be undertaken. For instance, several participants felt that the TBIs they used did not really address their key concerns, and made some interesting suggestions for added features they would like, including: personal reminders (including medication), mood tracking, and self-reflection:

"I think that maybe it was letting people down in a way, actually. (...) It doesn't have the medication, sleep, side effects, self-management of medication." – P112

Some TBIs facilitated a more personalised approach by allowing users to input their information and modifying the content in response. The treatment experience was made to feel more interactive, as opposed to "flat" or unresponsive, which may have mimicked some of the qualities of human-led therapy. Some of the methods for this included the use of questionnaires to tailor content, the ability to input data for graphs/charts, or being able to produce "feel-good" creative outputs.

"You can make your own animation. So each of the components is like part of a recipe. So you have your background which is you pick – do you want autumn or spring or something, so you pick something like that. And you're picking things that would make a really nice day for you." - P101

However, the potential downsides of inputting their own personal information to a TBI was recognized. This could have some unintended negative consequences, as participants may be required to input distressing information. This could either risk putting people off engaging with the TBI in the first place; or, recapping negative experiences could worsen their mood further:

"Sometimes if you look back on it, and you've been through a low period, it can make you a little bit upset, to be honest. You know when you look at it and you think "Oh my God, was I that bad?". (...) I tend to not look back on it if I can help it." – P110

4.4.4 Theme: Is it a relationship?

This theme explores whether participants interpreted their interactions as being like a relationship. Participants were asked directly whether they felt a "connection" to or a "relationship" with the TBI they used, as a way to open up the discussion towards the relevance of concepts usually reserved for human-human

interaction. Does the therapeutic relationship remain a valid concept when applied to TBIs? How do people talk about their interaction with the TBI, and is the concept of having a "relationship" with technology one that makes sense and is acceptable to TBI users?

4.4.4.1 Subtheme: Objection to a human-technology "relationship"

Use of terminology such as "relationship" or "connection" were rarely used spontaneously by participants. Participants often expressed that it was unusual or strange to frame their interactions with technology like this, and stated that they wouldn't have considered it in this way without being asked by the researcher. Those that did agree that they had a relationship with the technology after being asked were also in the minority; around two-thirds of the participants rejected this notion outright:

"Probably because it's not a person. You didn't have a relationship in that way with it. Just what it was – just I wouldn't. It's really funny you asked that question because that wouldn't have even crossed my mind, to actually even consider that I had some sort of relationship with it." – P108

What is particularly interesting is that while most participants rejected the phrase "relationship", there were many elements of participants' discussions that indicate they were experiencing a relationship of some sort with the TBI.

4.4.4.2 Subtheme: A "human face"

For some, the notion of a relationship was most acceptable when it pertained to elements of the TBI demonstrating a human presence. For example, people built up relationships with the supporter that helped them to use the TBI:

"I think I did [feel a relationship] with the supporter. Definitely with the supporter, but not with the online thing." – P108

Similarly, feelings of familiarity with human contributors to TBI content could contribute to a sense of a relationship. For example, this could be with those providing voiceovers; in cases where the participant already had an established relationship with the TBI's creator; or input from other users that provided TBI content:

"I think um initially when [TBI creator name] was writing all the homilies himself, it [the relationship] was with him and the website. (...) when the new team came along and then they got on board the users, so it became more of a community, and the users are contributing. And I do feel part of that." – P112

It appeared that participants found it easy to build a relationship with the TBI features that clearly communicated a "human face". How did people feel about their interactions with the technology that does not involve this?

4.4.4.3 Subtheme: Functionality

Some participants conceptualised their interaction with the technology in terms of functionality; the technology existed to serve a purpose and constituted a series of tasks that could help them with their mental health. Engaging with the intervention did not involve having a personal, human-like relationship with the technology, and instead, the TBI was conceptualised as being only a tool or a set of tasks.

"It really is analogous to the dumbbells in the gym (...) It really is the usage of a tool. It really is the same as going to the gym, it's "right this is something I'm going to work on", be it for self-improvement or for rehabilitation" – P106

It should be noted that despite not feeling a "relationship", this didn't necessarily mean that TBI use was not beneficial. The functional aspects were still helpful (at least to an extent) for these participants, as they could be used to bring about improvement in their individual situations. However, a lack of personalisation may be what limits TBIs being seen as more than just a tool, and preventing a therapeutic relationship being established.

4.4.4.4 Subtheme: Role of interactivity in the therapeutic relationship

Some participants rejected the notion of an "interaction" with a TBI altogether. This was often the case when the TBI was perceived as being simply uni-directional; a user could read through the information, but nothing about the TBI required substantial individual input (see Theme "Interactivity" for more details). With TBIs that offer standardised content without tailoring, the degree to which its content matches the user's needs relies upon chance. It appears that this limited the development of the user-TBI relationship, as many participants that rejected feeling a

relationship also discussed how the TBI was not interactive or personalised. Similarly, the notion of a "relationship" was also rejected when the participant did not feel the content was relatable. It is interesting that participants accepted that a relationship *could* develop with more intelligent designs that took account of their circumstances more accurately.

"It's not a website that learns from your responses, and then tailors its questions accordingly. So it's not an intelligent website. (…) It might be that a large percentage of people in the same situation as myself doing the course, respond in the same way such a large percent of the time, that they are able to build some intelligence into the course. I would certainly not exclude [the possibility of feeling a relationship], if that was the case." – P105

This indicates that developing a relationship with a TBI isn't impossible; rather, current limitations in design sophistication is preventing this occurring. A sense that the TBI is applicable to your individual circumstances and needs appears to be key for developing this relationship. Those that did say they felt a relationship emphasised the feeling of being understood by the TBI, by the provision of relatable content and choice offered in how it was used.

"Does it understand me? I think that's it, it does understand the user. So you don't even realise how comfortable you feel with it until somebody asks you (laughs) your relationship with a website" – P101

This theme has illustrated the range of attitudes participants have shown towards the idea of having a relationship with a TBI, and the reasons that may underlie their feelings. Asking people whether they had a relationship with the TBI was clearly perceived as strange, and it seems that people aren't used to viewing their interactions with technology in terms of a "relationship". Whilst people frequently rejected the notion outright, many elements of discussions across participants indicate what *can* make an interaction with a TBI feel somewhat like a relationship, particularly when they system responds to the individual in an intelligent way.

4.5 Discussion

This qualitative study examined users' interaction and engagement with TBIs, and whether their interactions resembled a therapeutic relationship. It was found that a sense of mutual understanding and the appearance of a friendly and compassionate system could contribute towards stronger engagement with TBIs. Additionally, feeling that the system was trustworthy and credible was key for users. It was incredibly important that users felt some control over how and when the TBI was used, and could tailor and personalise the TBI to their own situation. Indeed, this personalisation and interactivity seemed to underlie whether people felt a therapeutic relationship with the TBI or not. When asked directly, people often outright rejected the notion, and it is clear that the concept of a "relationship" with technology seems odd to people. However, the data suggests that it would be possible to build up a therapeutic relationship with a TBI if the technology is personalisable and responds intelligently in the way a human might do. This paper yielded a number of interesting tensions that clinicians and developers face in creating or improving TBIs, and are summarised in Box A.

The present findings regarding the importance of interactive content is in line with previous research. For example, Bresó, Martínez-Miranda, Fuster-García, and García-Gómez (2016) have been designing a flexible e-health treatment for major depression that includes daily sessions which respond adaptively to users' circumstances. Their system combined input from the user, their clinician, and activity sensors to suggest appropriate activities and CBT exercises in response to their clinical needs. Future TBI development should focus on producing and evaluating systems that can take account of users' circumstances, and that can react accordingly to changing presentation or preferences. It would be interesting to see if more flexible interventions increase engagement, adherence, and perceptions of a therapeutic relationship.

It is also important to consider whether the findings map onto the dimensions of working alliance theory, rather than generic notions of a therapeutic relationship, to advance our understanding of engagement with TBIs. Bordin's (1979) theory of the working alliance is probably the most widely used, and is constituted of client and therapist agreement on the tasks and goals of therapy, and the development of a

strong interpersonal bond. Arguably, the strong role found for personalisation in this study maps onto the "goal" and "task" components. This is because the ability to enter your individual goals into a TBI or choose the tasks used to meet these goals are key to personalisation, which was central to participants' engagement. Aspects of the themes may also overlap with the notion of having a "bond" with the TBI, as evidenced by: feeling understood by the use of relatable examples; a positive tone in the TBI to help them feel optimistic and hopeful; and trust in the TBI, as developed by perceptions of information security and the TBI credibility. These findings can be used to develop working alliance theory in new treatment contexts, which has been highlighted as a research gap (Elvins & Green, 2008).

Box A – Tensions in clinical implications

1. Tailoring a TBI to an individual's circumstances is important, but must be weighed against data security concerns and the potential for the input of personal data to be upsetting.

2. Human support is beneficial for motivation and encouragement, but the non-human side of the technology can help people be more open and not feel judged.

3. Attempts should be made to make TBIs that are more engaging, empowering and enjoyable to use, whilst not treating serious issues as trivial.

However, people are clearly not used to framing their interactions with technology in this manner. Participants rarely referred to their interaction this way spontaneously, and nearly always rejected the term when asked. This is similar to work assessing anthropomorphisation towards technology, which found that people are reluctant to consider their phone or computer in human terms (Lupton & Noble, 1997; Wang, 2017). People may dismiss the notion of having a relationship with technology for multiple reasons, including: cultural anxiety regarding the power of

technology to "take over" society; concerns that technology dehumanises the user; and a general disdain towards "computer nerds" (Lupton, 1995; Lupton & Noble, 1997). The notion of a therapeutic relationship with a TBI does not appear to be acceptable on face-value, which may present challenges when attempting to measure these constructs.

4.5.1 Further research

An examination of whether the strength of the therapeutic alliance impacted upon TBI outcomes is beyond the scope of this qualitative study. It seems likely, since those that experienced the TBI as personalised and trustworthy (indicators of a therapeutic alliance) appeared to engage better with it, and may have had improved therapeutic outcomes. More quantitative research is needed to determine this.

As noted in the introduction, there have been some prior attempts to adapt existing therapeutic alliance measures for TBIs (for example, Berger et al., 2014; Clarke et al., 2016; Kiluk et al., 2014). However, it is often found that there is no link between the user-TBI alliance and the outcomes of the TBI (for example, Clarke et al., 2016; Kiluk et al., 2014; Ormrod et al., 2010), which is at odds with research on face-to-face therapies (for example, Horvath et al., 2011). This lack of an alliance-outcome link in TBIs could be because therapeutic alliance is not as influential in determining TBI outcomes (Ormrod et al., 2010). Alternatively, the use of measures developed in a different context could be limiting our ability to discover this link, by not adequately capturing elements of the therapeutic alliance which are particularly important in TBIs (Clarke et al., 2016). To find out which it is, there is a need to construct new measures of the therapeutic alliance for a TBI-specific context. These qualitative findings will be of use when attempting to create such measures, as these have directly asked TBI users for their perceptions and experiences. Creating new measures with full user involvement is a key recommendation for future alliance research, to ensure the phrasing and item wording makes sense to those outside the academic community.

Further research could also involve experimental manipulation of TBI features that may promote alliance, and could use the new measures to examine whether this results in a change in alliance quality. For example, a tailored intervention could be compared with a non-tailored intervention. Something similar

has been previously done by Berger et al. (2014), who did indeed find higher ratings of alliance for a tailored program versus a standardised program for depression. It would be interesting to conduct further studies of this type.

4.5.2 Study limitations

The study's sample used a wide variety of TBIs, with many different formats and treatment approaches. The decision to sample from a range of users was deliberate, since the alliance is considered to be a transtheoretical construct which applies across therapeutic change contexts (Horvath, 2006). Furthermore, the same TBI package was used by five out of thirteen participants due to our recruitment sources, meaning that the experiences of this particular user group may be overrepresented. Attempts were made during analysis to ensure that the themes applied and were meaningful for the sample as a whole, but some level of detail may have been lost in the process. At all levels of analysis, the developing themes were checked for consistency with the original transcripts to reduce this possibility.

Additionally, the recruitment target of 15-20 participants was not met despite the range of advertising methods employed. Had a few more participants been recruited, the data could have been further enriched by more divergent and novel perspectives. The majority of participants accessed the TBI following referral from healthcare providers, as opposed to seeking out a TBI on their own initiative or via peer recommendation. Saturation is the point at which new data ceases to illuminate the phenomenon of interest (Bryman, 2008). Although a study found saturation could be reached after twelve interviews (Guest et al., 2006), there is doubt over the existence of a concrete number of interviews which guarantee that saturation is achieved, as there are many influencing factors at work (Mason, 2010). Whilst the number of new codes identified did decrease towards the last few interviews – suggesting saturation – with a few more participants that had willingly sought a TBI, there may have been additional codes that altered the subsequent themes.

Another potential limitation is the sample's representativeness. Although the aim of qualitative research is not for generalisability in the quantitative sense, attempts should be made to build comprehensive theories which apply across a range of cases (Morse, 1999). As such, it is important to note that the perspectives of participants may have varied should a different sample have been obtained. The

sample mostly identified as White British, and it is possible that the TBIs might disproportionately provide material (such as scenarios or case examples) which are more relatable to this group. This material may not be received in the same way by people from other backgrounds, which may impact upon levels of engagement.

Another limitation of this paper is potential bias introduced by the researchers. The team is comprised of academics working in the field of digital technology for the delivery of mental health support, and it is possible this has influenced the findings somewhat. The team is likely to be biased towards identifying positive experiences that people have during TBI usage.

4.5.3 Conclusion

Engagement with TBIs can be strongly facilitated with a high degree of user control and personalisation of the TBI content. Data from this qualitative study leads us to conclude that it is theoretically possible to develop an alliance with a TBI itself, which depends significantly on the ability of a TBI to adapt its content in response to its users' needs. These findings are crucial given the wider context of increasing digital technology use in the delivery of mental health services, as they can be used to inform the development of more engaging TBIs.

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So what does all this mean? Discussion and conclusions

5.1 What do the systematic review and qualitative interview study tell us about the therapeutic alliance in TBIs?

The core aim of my thesis was to explore the nature of the therapeutic alliance in the context of digital technology-based interventions (TBIs) for mental health problems. By bringing together the findings of the systematic review and qualitative interview study conducted for this thesis, substantial progress has been made towards achieving this aim. Data has been synthesised from a range of qualitative and quantitative study designs, and from people with diverse clinical issues that used a variety of TBIs. Thus, the contributions made to therapeutic alliance theory by this thesis are based upon a rich and diverse dataset.

5.1.1 The validity of therapeutic alliance theory in a TBI context

The most widely-researched theory of the alliance is the working alliance theory proposed by Bordin (1979), concerning the extent to which the interaction between client and therapist is exemplified by collaborative and purposive work (Hatcher & Barends, 2006). The general sense of collaboration is supported by studies in the systematic review that assessed "partnership" with the Agnew Relationship Measure (ARM; Agnew-Davies et al., 1998), indicating a role for collaboration in a user-TBI alliance. There are three main features of the therapeutic alliance in working alliance theory, which were largely found to be supported in both the systematic review and the qualitative interviews, which I will now address in turn.

Firstly, both papers supported the role of a "bond", which is the component that in face-to-face therapy pertains to the quality of the interpersonal relationship between therapist and client (Bordin, 1979). Taken together, these studies showed the significance of feeling understood by and relating to a TBI, as well as the importance of empathy, trust, and feeling encouraged (**qualitative theme: a supportive, safe interaction**). It was critical that a TBI presented itself as friendly and compassionate, and conveyed a sense of positivity and hope. There were many TBI features that could do this, for example: friendly and encouraging cartoon "avatars" of the TBI's authors; the opportunity to create "feel-good" animations or artwork; and tasks that encouraged users to list their strengths or positive things in

their lives. These concepts illustrate that the notion of a "bond" is still relevant for digital technology-delivered interventions.

Another of Bordin's (1979) alliance dimensions is the extent to which the goals of therapy are agreed between client and therapist (goal agreement). The systematic review indicated the value of being able to set and work towards their goals in a TBI, and the qualitative interviews confirmed the significance of TBI personalisation, including setting meaningful goals (**subtheme: personalisation**). These findings clearly map onto the notion of goal agreement, and therefore I conclude that this dimension of working alliance theory remains valid in TBIs.

The third component is task agreement (Bordin, 1979); clients and therapists must collaborate during therapy to agree actions which should be undertaken by each party to bring about therapeutic change. Data synthesised in the systematic review supported the relevance of task agreement to TBIs, as qualitative themes demonstrated that it was frustrating to participants when the tasks offered or techniques taught by the TBI were seen as irrelevant to their needs. Regarding the qualitative interview study, findings (**subtheme: personalisation**) concerning personalisation supported the relevance of task agreement; participants' ability to select which tasks they engaged with to meet their therapeutic needs was a key part of engagement with a TBI. I therefore conclude that task agreement is also a valid alliance dimension in the context of TBIs.

It appears that the three components of working alliance theory remain valid in a user-TBI interaction - but are there any additional factors? Some of the papers in the systematic review researched dimensions of the ARM (Agnew-Davies et al., 1998), but they were less extensively researched and thus claims about their validity cannot be made with as much confidence as the working alliance theory dimensions. For instance, the relevance of *confidence in treatment* was somewhat supported by the systematic review. This was further supported by qualitative interview findings (**subtheme: trust**); for example, perceptions of the TBI's credibility enhanced engagement. This could be achieved when a credible organisation referred the user to that particular TBI, the materials provided as part of the TBI demonstrated consistency, and when the TBI was judged to have received sufficient expert input in its development. Additionally, the concept of *openness* (feeling free to disclose

personal issues without fear of judgement) was generally supported in the systematic review. This is reinforced by the qualitative interview findings (**subtheme: friendliness and compassion**) illustrating that technology was perceived as less judgemental than a human therapist, and that increased levels of privacy were influential for engagement, disclosure, and openness.

Client initiative (the degree to which the client can take control over the therapy's direction) only received limited support from my systematic review data. This is interesting, as it seems this concept has a high degree of face validity in TBIs since this treatment format is mostly self-directed. Some of the qualitative interview themes can be interpreted in light of *client initiative*, however. Giving users additional control over the course of treatment appears to be empowering, more engaging, and possibly more effective (**subtheme: user control**). Participants emphasised the importance of being able to choose when they used the TBI or how often they engaged with it. The limited support for *client initiative* found in the systematic review data might be due to the subscale's psychometric issues (poor internal consistency; see Agnew-Davies et al., 1998), rather than definitive irrelevance of the concept. Given the indications of the concept in the qualitative interview themes, the role of *client initiative* as an alliance component remains a worthy avenue of future research in TBIs.

Despite the apparent mirroring of therapeutic alliance concepts by a TBI, the notion of a "therapeutic *relationship*" was nearly universally rejected by qualitative interview participants (**theme: is it a relationship?**). This idea was seen as incredibly strange, and their interaction with the TBI was frequently characterised as functional or the usage of a "tool". Participants did find the idea of a therapeutic relationship acceptable when referring to aspects of the TBI that very clearly communicated a "human face" (for example, the clinician supporting them to use it, voiceovers, or content produced by other TBI users). It was also sometimes expressed that a relationship with the TBI might have been possible if the TBI offered more interactivity. This indicates that a perceived lack of therapeutic relationship could be arising due to design issues, rather than that notion being entirely impossible to some users.

Moreover, interactivity was one of two potential new, additional alliance dimensions for TBIs, which were suggested by the review's framework synthesis. As the value of inputting information to a TBI and personalising its content frequently came up as facilitating engagement, interactivity was considered as a possible dimension. This may mimic to a certain extent features of a human therapist, that can respond and reflect back a client's experiences. The second of new dimensions is availability. As demonstrated by the qualitative themes of the systematic review's included papers, participants valued the ability to access a TBI any time of day. "Availability" as a dimension indicates the value of having a reliable relationship with the TBI, as it available for someone to use for mental health support whenever and possibly wherever (if being accessed by a portable device) they need it. In the qualitative interview study, participants also noted the significance of engaging with the TBI when or how often they liked (**subtheme: user control**).

The importance of these dimensions of "interactivity" and "availability" are perhaps reflective of the inherent differences in treatment delivery when comparing TBIs and face-to-face treatment. Interactivity in face-to-face treatment is assumed due to the interaction between client and therapist, while deliberate efforts must be made during TBI development to create a system that can respond appropriately to a user's inputs. Perhaps "availability" is especially significant for a user-TBI alliance because enhanced and flexible access is a specific advantage of TBIs, whereas a human therapist cannot be instantly available at any time of day or in any context.

In summary, many components of therapeutic alliance theory which have received extensive attention in face-to-face therapy appear to largely retain validity when applied to a user-TBI interaction. The additional factors of "interactivity" and "availability" might be new alliance dimensions unique to the TBI experience.

5.1.2 Influencing factors on the user-TBI therapeutic alliance

Findings from both papers also identified key factors that influence the alliance in TBIs. With respect to TBI-related factors, it appears that certain technological features, such as narrators, avatars and relatable characters, and a perception of privacy and credibility can foster the development of a warm bond with the TBI. The use of a mobile device could facilitate privacy, as well as features such as passcode locks for enhancing security (**subtheme: trust**).

TBIs that are tailored to users' needs can produce higher alliance ratings, and qualitative interview themes also illustrated the significance of program tailoring, indicating that the technological capacity to edit TBI content influences the alliance (**subtheme: personalisation**). Other key features of a TBI that were found to facilitate engagement included: a structured format; the provision of information in "manageable" amounts; the ease of navigation; and a clear explanation of its rationale (**subtheme: does the user understand the TBI?**). Therefore, these features may be influential factors for therapeutic alliance quality.

In terms of client characteristics, mental health status was a factor that influenced the user-TBI alliance. There was evidence in the systematic review that users found engaging with a TBI overwhelming when very low, and similarly, the qualitative interviews found engagement with the TBI when depressed was very difficult if the information was not presented in manageable amounts (**subtheme: does the user understand the TBI?**). A paper in the systematic review also examined alexithymia, which was not related to participants' therapeutic alliance with a TBI. Unfortunately, there was a very small amount of research identified by the systematic review that studied the relation of client characteristics to the therapeutic alliance. The association between alliance and dropout status was also studied in one paper, but they were unrelated.

There were only two other factors examined by papers included in the systematic review for their relation to alliance quality. Two papers looked at the change in alliance levels over time: confidence in the TBI grew over time; dimensions relating to "partnership", "goal", and "task" remained stable; perceptions of "bond" remained stable in one paper, but declined in another. As such, the progression of therapeutic alliance over the course of TBI treatment is currently unclear. The other factor examined was the therapeutic alliance with a human therapist. From this, it was concluded that developing a therapeutic alliance with a TBI is not detrimental to the quality of alliance with a human therapist. There is a vital need for much more research focusing on client, treatment and TBI factors that can be facilitative or detrimental to the user-TBI therapeutic alliance.

5.1.3 Measurement of the therapeutic alliance in TBIs

This was addressed by the systematic review, which I will recap briefly here. The various forms of the Working Alliance Inventory (WAI, Horvath & Greenberg, 1989) and the ARM (Agnew-Davies et al., 1998) were the most popular alliance measures. This illustrates the range of alliance concepts that have been researched in TBIs, the three components of working alliance theory, as well as the additional components of the ARM (openness, confidence, and client initiative). These measures do not take into account the potential new alliance variables of interactivity and availability, which were identified in the systematic review and supported by the qualitative interview themes (**subthemes: user control, personalisation**). It is likely that further adaptations to alliance measures must be made, or new measures developed altogether, to take account of the distinct context of TBIs. This is outlined in more detail in the "further research" section below.

5.1.4 Therapeutic alliance and outcomes in TBIs

The papers included in the systematic review generally found no associations between measurements of the alliance (using adapted measures) and clinical outcomes such as anxiety, depression, stress, substance use, and functioning. As therapeutic alliance quality is consistently linked to the outcomes of face-to-face therapy (Horvath et al., 2011; Horvath & Symonds, 1991; Martin et al., 2000), it is interesting that therapeutic alliance might play a different role in TBIs. A measure developed specifically for TBIs may help to answer questions about the role of the alliance in TBI outcomes; see "further research" section for a more detailed discussion of this issue. It is worth re-stating here (see Section 3.5.5 for details) the quality issues present in the included papers which assessed the alliance-outcome link. As a result, we cannot be sure that an alliance-outcome link is non-existent, since failure to identify it could equally be due to the frequent issues in the literature (e.g. high dropout and incomplete outcome data).

With regard to the possible function of therapeutic alliance in TBIs, it was found to be related to program engagement in the systematic review. The user-TBI alliance was associated with indicators of engagement such as more frequent log-ins and modules of the TBI that were completed by users. It is possible that therapeutic alliance may have more of an indirect association with effectiveness of TBIs via

increased engagement, as the amount of treatment completed is related to the effectiveness of TBIs (Donkin et al., 2011). Much more research will be needed to examine the role of alliance in treatment delivered by TBIs – does a stronger alliance promote better engagement with the treatment (i.e. higher usage), which results in improved effectiveness? As research has also demonstrated an influence of treatment preference on subsequent outcomes of TBIs (Cooper et al., 2017), participants' prior attitudes towards TBIs should also be taken into account when investigating the role of the therapeutic alliance. It should also be noted that findings about the association between alliance and satisfaction were conflicting. More research is also needed to better understand how these treatment factors relate to one another (or not).

5.2 Relation of the findings to previous research and theory

As outlined in detail above, there is general support for Bordin's (1979) working alliance theory, and some of the other therapeutic alliance concepts outlined by the ARM (Agnew-Davies et al., 1998 - confidence, openness, partnership). As the two potential new variables (interactivity and availability) are not covered by these models, they must be examined in detail by later research efforts.

Cahill et al. (2008) developed a conceptual map which identified three key processes involved in a therapeutic relationship across the course of therapy – establishing, developing, and maintaining the client-therapist relationship. Prior research has adapted this framework to the common factors present in self-help books (Richardson et al., 2010), although the authors note that *books* might be limited in the extent to which they exhibit common factors such as flexibility, as the text of a book is fixed. Could it be that TBIs have greater capabilities for some of these common factors, then? This conceptual map has been applied to the content of TBIs for depression (Barazzone et al., 2012), largely finding support for the suggestion that digital technology-based approaches to mental health management contain features indicative of a therapeutic alliance.

Generally, the present findings also lend support to this previous work, although I did not use an identical framework to conduct data analysis. My research adds to the literature on the alliance in TBIs, as TBI users were directly asked about their experiences, rather than an examination of TBI content. For instance, it was found that the crucial factors from the user's perspective were consistent with

features key to Cahill et al.'s notion of *establishing* a relationship – the empathy and warmth of a TBI was important, as well as the ability to negotiate goals. There was also evidence of the *maintenance* of a therapeutic relationship; for example, Richardson's (2010) adaptation to the model notes the importance of strategies for preventing alliance ruptures or drop out from self-help materials. The present research found that TBI supporters could be crucial for motivation, especially when considered alongside some difficulties experienced with procrastination owing to the flexibility of TBI access. In summary, TBIs have the technological capability for building a therapeutic alliance, although the extent to which this is achieved will rest on the features included in the TBI and the presence of a supporter.

Relatedly, another perspective is the "triangle of alliance" (Cavanagh, 2010), which posits that alliance might take a triadic form in TBIs. This means that the therapeutic alliance involves the relationship between the user, the TBI, *and* the supporter involved in its delivery. Cavanagh (2010) did not elaborate on exactly how the three parties interact with one another to create an alliance, and although I did not deliberately set out to investigate the alliance triad, the suggestion broadly maps onto the present findings. For instance, participants in the qualitative study emphasised the value of having a supporter for motivation and increased adherence, which is supported by prior research that indicates the key role of a supporter for e-health interventions (Kelders et al., 2012; McClay, Waters, Schmidt, & Williams, 2016). It could be that a supporter maximises the alliance-building opportunities present in a TBI; for example, by helping a user engage with the TBI in a way that meets their goals and needs.

However, the feeling that computers or technology is entirely non-judgemental was reassuring for some, and they felt able to open up with a computer in a way that may have been harder with a person. This mirrors prior research which found that perceptions of TBIs as non-judgemental is seen as advantageous by users (for example, Gega et al., 2013; Sánchez-Ortiz et al., 2011). Interventions delivered by technology may be beneficial for encouraging people to engage with therapy for highly stigmatised or shameful issues, but the desire to have a non-judgemental element of therapy must be balanced against the desire to have human support. It appears that the "triangle of alliance" (between a user, TBI and supporter) is likely to be complex, due to the tensions regarding the pros and cons of receiving human

support to use a TBI. I did not deliberately aim to examine this triadic approach to alliance, as I was specifically interested in the user-TBI alliance alone at this early stage in the field. There is a need to consider this triangular aspect as part of future alliance research, particularly when developing new therapeutic alliance measurements.

As touched upon in the introductory chapter, there has been a degree of conceptual confusion about the distinction between the therapeutic *alliance* from other components of the therapeutic *relationship (Horvath, 2006).* Hatcher and Barends (2006) provide a conceptual distinction, using Bordin's therapeutic alliance theory (1979). They consider the *relationship* to be a "vastly encompassing concept that includes any and all motivations and activities of client and therapist, including hostility, seductiveness, humor, ingratiation, guilt, and so forth" (p. 298), whereas the therapeutic *alliance* is demonstrated by collaborative and purposive therapeutic work.

The alignment of the present findings to Hatcher & Barend's (2006) distinguishing feature of the therapeutic alliance, the presence of collaboration and purposive therapeutic work, should also be examined. I believe they do align with this; the findings centred around the experiences of TBI features such as the ability to personalise the TBI, relate to the content, or set appropriate goals with it. This maps onto the concept of collaboration, as it indicates the value of a TBI offering content to a user that can be applied to their own lives. The most engaging and preferred TBIs appear to be built upon a two-way, interactive process based upon collaboration between the user and the technology.

At the time of planning the qualitative interview study, I was not aware of any other paper that specifically sought to explore the user-TBI alliance using qualitative interviews. As such, I planned this paper to fill this gap, and therefore add to the knowledge base by exploring the therapeutic alliance directly from the perspective of those that have used TBIs for their mental health. Over the duration of the study, the research by Clarke et al. (2016) was published, which used qualitative interviews to explore the therapeutic alliance in a TBI aimed at anxiety, depression and/or stress symptoms. Their interview questions were largely based on the ARM (Agnew-Davies et al., 1998), whilst those of the present study were based mainly on

working alliance theory or more general questions about their engagement and experiences with the TBI. As noted in the main qualitative interview paper, the present qualitative paper has also added to their methods in several other ways. People with a wider range of clinical issues were recruited, that had used a range of different TBIs. Therefore, the therapeutic alliance across more heterogeneous clinical settings was explored.

5.3 The future of TBI development

But what do all the findings of this thesis mean for the development of the next generation of TBIs? Participants in the qualitative interviews often expressed a desire for "high tech" interventions, that would maximise engagement and entertainment. By possessing sophisticated and complex features, it was thought that a TBI could better hold users' attention, allowing for more of the treatment to be completed, as well as reacting adaptively to changing circumstances.

However, the process involved in developing, testing and implementing new interventions is extremely long. For example, Whittaker, Merry, Dorey, and Maddison (2012) note that the progress from conceptualisation to testing and implementation took 3-4 years in their smartphone applications for smoking cessation and depression prevention. Considering the wider context of the incredibly fast pace at which digital technology develops, it is possible that interventions will be out-of-date before testing is complete (Kumar et al., 2013), and public expectations of the capacity of technology will likely have increased during that period.

However, this should not discourage efforts to create the most engaging TBIs feasible, and make efforts to update them as and when appropriate. Given the additional benefits of smartphones for digital health (for example, portability, internet connectivity in a wide range of locations, privacy due to a smaller screen than a laptop), and the increasing pervasiveness of smartphones and apps in people's lives (Ofcom, 2015), it is likely that TBIs will continue to progress towards access via a smartphone. Interventions delivered by smartphone applications must be continually refined and updated to take account of progress in technology (Whittaker et al., 2012).

Remaining up-to-date is not the sole issue pertinent to the level of sophistication in TBI design, as a complex underlying design is valuable. For example, intelligent algorithms that respond effectively to user input, with a wide range of options and responses that allow for personalisation seem a necessary development, but this complexity should not spill over into the TBI interface. This is due to the importance of accessibility, as people with learning disabilities or mental health problems may already face access barriers arising from complexity of certain digital technologies (Bernard et al., 2015; Tanis et al., 2012). Crucially, participants in the present qualitative interview study expressed a desire for systems that are straightforward and easily navigable despite prior IT ability, that would not present unnecessary barriers to treatment engagement or distractions. This was even more pertinent when considering the use of a TBI in a state of active ill mental health. Rigorous user testing could significantly reduce the risk of these pitfalls; if the TBI is not usable, its creation is a waste of time, effort and funding. Involvement of the target user group in TBI design from the outset is essential, to ensure that the design matches users' needs (Fleming et al., 2016).

When developing a TBI, attention must be paid to the focus on the clinical symptom reduction, versus material pertaining to quality of life. Qualitative interview participants explained the need for TBIs to be inclusive in their approach to recovery, rather than taking an exclusive focus on negative experiences and symptoms. Many participants indicated they would like TBIs to be uplifting, recovery-focused, positive in tone and sometimes more entertaining. Participants stated the need for a multidisciplinary approach to developing TBIs; for example, the role of people who are experts in learning and technology, rather than just mental health. It was expected that input from diverse disciplines would ultimately result in a more engaging TBI, and it seems that TBIs could be about more than simply being "treated" – they could also be about education and empowerment.

Qualitative interview participants wanted TBIs to pay attention to positive aspects of life and their strengths, rather than a sole focus on negative experiences and symptoms. This supports the research of Todd et al. (2012), which found that people with bipolar disorder considered recovery to be concerned with more than treatment of their symptoms, and involves other goals such as improved quality of life. It is possible to link this to the Broaden and Build theory of positive emotions

(Fredrickson, 1998): the experience of positive emotions makes it more likely that people follow novel or creative paths towards thought or action, which in turn builds their social, physical, and intellectual resources. Therefore, the extent to which TBIs promote positive emotions may have a beneficial effect on developing coping resources.

On the other hand, developers must be cautious that this does not go far, with the resulting TBI appearing to not take the user seriously. It is not difficult to imagine a scenario in which taking a more "fun" approach could be offensive; for example, if a TBI tried to take a light-hearted approach to an extremely distressing issue such as self-harm. The appropriate amount of cheery or entertaining content is likely to vary from clinical group to clinical group, and this would have to be piloted extensively.

It was also found that inputting personal information into a TBI could be upsetting for users, and reflection upon negative experiences and symptoms could worsen users' mood. This relates to previous qualitative research on a TBI for depression, that found some people felt that their depression was worsened by seeing their issues reflected back at them by the program (Knowles et al., 2015). This is also in line with the MONARCA trial research, which found some participants using a smartphone to monitor their bipolar symptoms daily had a tendency to show more depressive symptoms (Faurholt-Jepsen et al., 2015). The authors hypothesised that the daily exposure to negative experiences may have induced a negative processing bias. It is possible that the input of information about symptoms can be detrimental under certain circumstances. We must be cautious about this, and devote more attention to the potential negative effects of internet-delivered therapies (Rozental et al., 2014).

There is a careful balance to be struck in the way a TBI is designed, as the opportunity to input information and personalise the TBI *can* be highly valuable. It could be that a TBI gives users an option to provide detailed information about their own circumstances, but this is not a necessary requirement to engage with the TBI in some way. Those that do not feel able or comfortable inputting such information could be given alternative methods for identifying the content relevant to them, such as clear shortcuts and links that take users towards relevant information. Developers

must be mindful of the need to foster hope and positivity, and not place excessively high demands on the user who may be in a state of low motivation or poor concentration at the time of use.

Another key challenge for TBI development is the degree to which the technology mimics more fully a human therapist. Esposito, Esposito, and Vogel (2015) note the difficulties for human-computer interaction research in building programs which correctly detect human emotion. In all likelihood, it will be a while before TBIs are available that respond accurately and sensitively to incredibly nuanced human experiences and expressions, in the same way that a human therapist could. Qualitative interview participants largely rejected the idea of having a relationship with the TBI, despite indications in their discussions that they were experiencing alliance-like processes.

It is possible that increased attempts to make a TBI behave like a human (with the idea of increasing alliance-related processes in treatment) may result in the alienation of users. This bears resemblance to the "uncanny valley" hypothesis (Mori, 1970), which hypothesised that as something approaches realistic human-like qualities, there is a dip in affinity past a certain point, as the form appears creepy, or strange. The form strongly resembles a human, but is not quite human-like enough, which produces a feeling of unease. This is reminiscent of the qualitative findings of Gega et al. (2013) included in the systematic review; attempts by the TBI to convey empathy by the use of spoken verbal statements was perceived as being insincere by users, and were off-putting as a result.

The qualitative interview results indicate that in some ways, users wanted TBIs to behave like a person (i.e. responding to their personal needs, the display of empathy), but not behave *too much* like a human, because of the high value placed on the additional privacy and the non-judgement afforded by the technology. The uncanny valley hypothesis was developed with human-like forms in mind such as robots, dolls, and characters on a screen (Seyama & Nagayama, 2007). It does not feel a far stretch to consider the hypothesis in terms of the way a TBI presents itself as more or less "human-like", particularly with regard to TBIs which contain animated characters, avatars and narrators. Mori (1970) recommended that designers

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do not aim for a total replication of a human-like form, and instead should strive to build a sense of familiarity, which could be a goal for TBI developers.

Privacy and security was found to be important for trust (an aspect of a therapeutic alliance) with a TBI; interviewees explained their concerns over information security, and ways that a TBI could enhance security, such as the use of fingerprint locking. The systematic review findings also indicated worries over confidentiality when inputting personal data to a TBI. However, findings from both papers in my thesis explain the importance of personalisation for building alliance. This may increase the information security threat present, if the next generation of TBIs involve the option to input highly sensitive personal data. Considering that 95% of health apps were found to pose some risk to privacy or information security (Dehling et al., 2015), there is an urgent need to ensure that users are aware of the potential risks present in using TBIs, especially if these are not accessed via trusted health providers.

If health services are commissioning certain TBIs for use in their services, it is vital that matters of information security and ownership of data are given the necessary consideration. As covered in the introductory chapter, health-related smartphone applications have the possibility of generating profit from users' data; it can be treated as a commercial entity, and users may not always be aware of this (Lupton, 2014b). Considering the vast range of health-related smartphone apps freely available for downloading, it is likely that many of these do indeed sell user data to permit free downloads and make a profit. Any TBI that does offer data inputting functions should be very clear with its users about what happens with their data, and should make full use of the available strategies within digital technology for increased security, such as fingerprint-locking and passwords.

There are numerous challenges facing developers of the next generation of TBIs, and the key recommendations from this section are summarised in Box B. The incorporation of user perspectives from the beginning of the design process is more likely to produce TBIs that are can engage and build an alliance with its users, and subsequently will reduce the likelihood of wasting money and resources devoted to the development of TBIs. The most useful approach might be to provide choice in the way a TBI is used. A user group who are experts by experience will help with

identifying appropriate options, as there is not necessarily a "one size fits all" answer to these dilemmas.

Box B – Key learning outcomes for TBI developers and providers

- Strive for "high-tech" and engaging interventions to hold users' attention.	- Smartphone access for portability, internet connectivity across contexts, enhanced privacy.
- Give a range of options for personalisation by user input, which use intelligent algorithms to tailor TBI content as a result.	- User input should be optional, to reduce compulsory demands on the user and the risk of inducing negative emotional states.
- Ensure the TBI includes features to protect users' information, and be clear regarding ownership of data.	- Be wary when building "human-like" aspects into a TBI, as this can be unconvincing. Aim for familiarity.
- Include features relating to recovery, quality of life, or positive experiences.	- Involve the target user group in designing the TBI and at all testing stages.
- Easily navigable systems.	- Involve multiple disciplines in designing a TBI, spanning technology, learning, and clinical expertise.

5.4 Reflection and limitations

I would now like to offer some discussions on how the methodological decisions made may have impacted upon the findings of my thesis, and some reflections on the research process.

5.4.1 Systematic review

5.4.1.1 Including qualitative research

As a result of comprehensive searches, papers were included spanning a range of clinical issues and TBI formats, which enriched the quality and coverage of the review. There was great diversity in the study designs used in the included papers, which helped bring together a rich and detailed synthesis of therapeutic alliance research in TBIs.

Although the majority of included studies used questionnaire measures, the papers that did use qualitative methods contributed substantially towards understanding the nature of the therapeutic alliance in TBIs. Interpretations regarding the phenomenon of interest may be substantially limited if certain studies

are excluded due to their design (Booth, 2001 cited in Jones, 2004); this certainly would have been the case in the present review, had qualitative research been excluded. Three papers were identified that provided qualitative data to the systematic review; these were invaluable for a richer interpretation of the data, and the potentially unexpected insights brought to alliance theory in TBIs. Despite this, it is likely that some papers have been missed out, by not doing additional qualitative-targeted searches.

5.4.1.2 Lack of meta-analysis

The final limitation of my review's methodology was that a meta-analysis to quantitatively examine the relationship between therapeutic alliance and TBI outcome was not possible. Our total review included only 13 papers, and of these, only 7 provided quantitative data involving the alliance-outcome association. When reviewing these 7 papers, it became apparent that there was a high degree of heterogeneity in terms of clinical group (for example, various anxiety disorders, depression, cocaine-dependence, adjustment disorder, and stress associated with pre-term labour), and the type of technology-based intervention (for example, the nature of supportive guidance provided, format, theoretical orientation).

As such, a meta-analysis was not felt to be appropriate. Indeed, the Cochrane Collaboration's handbook states that a meta-analysis may not be meaningful with studies containing a high degree of clinical diversity (Deeks, Higgins, & Altman, 2011); a meta-analysis under these circumstances may not be able to detect differences, and thus would not provide a more useful picture of the user-TBI alliance's association with outcomes. As increasing amounts of research is carried out regarding TBIs and the therapeutic alliance, studies might be able to be placed in more heterogeneous groupings, in which a meta-analysis could meaningfully be done. I attempted to compensate for this by analysing the alliance-outcome association using the synthesis method, and I still feel that the results produced are of significant value.

5.4.2 Qualitative interviews

5.4.2.1 The sample

Unfortunately, this study suffered from some recruitment issues; I had planned to recruit 15-20 users of TBIs, but recruited only 13, despite the wide range of strategies employed. The research team did not obtain ethical approval to access patients' data without their consent, which meant recruitment was somewhat reliant upon staff working in NHS and voluntary services to connect us with interested clients. Gatekeepers in health research (such as clinicians involved in participants' care) mediate researchers' access to potential participants, and may sometimes be reluctant to engage in research for reasons of time pressure and the availability of resources (Newington & Metcalfe, 2014; Patterson, Mairs, & Borschmann, 2011). There may be additional reluctance given the nature of the research topic, as there is evidence to suggest the NHS have some ambivalence about the increasing use of TBIs in mental health services (Berry, Bucci, & Lobban, in press). Due to time pressures involved in this student project, it was not feasible to add new study sites to increase recruitment. Perhaps interviewing a few more participants would have increased the diversity and richness of my findings, although I feel that the study produced fascinating and valuable themes which add substantially to the knowledge base about therapeutic alliance in TBIs.

The involvement of service staff in recruitment, as well as the opportunity for people to self-register their interest in the study, may have also introduced selection bias into the sample. Service staff may have been more likely to have approached service users that engaged well with treatment. Indeed, all participants recruited from services had completed most of the treatment course, with no participants that had dropped out at an early stage. Although there was diversity in opinion about TBIs in the sample, interviewing people that had dropped out would be a fruitful avenue for TBI research, as these people may have some useful things to tell us about what prevents users from establishing a therapeutic relationship with a TBI.

Although qualitative research does not aim for "generalisability" as an indicator of quality, in the same way that quantitative research does, it is still important that qualitative research attempts to build comprehensive theories which apply across a range of cases (Morse, 1999). Given that the qualitative interview

participants by and large identified as White British, questions may be raised about the extent to which our theories of therapeutic alliance might apply across a broader range of cases. Conclusions about the application of the findings to other groups are currently limited, as the TBIs that participants used may have been developed in such a way that means the content (such as scenarios and case examples) are disproportionately relatable to White British people. If I had interviewed a more diverse sample, I may have accessed more divergent perspectives about what makes a TBI more engaging and builds alliance with a wider range of people. This is important when considering that self-help interventions which make greater efforts towards cultural adaptation, such as the use of adapted metaphors and consideration of the socioeconomic or political context, are more effective at improving users' mental health (Harper Shehadeh, Heim, Chowdhary, Maercker, & Albanese, 2016). This highlights the importance of providing TBI content that is relatable to users.

Similarly, the qualitative interview participants and participants from the research covered in the systematic review might contain data mostly from those that have a pre-existing interest, comfort, or familiarity with the technology. This is of concern, considering that many interviewees self-referred into the study. Information about computer experience was rarely collected by the papers included in the systematic review; this is with the exception of Kiluk et al. (2014), although they did not examine associations between computer experience and the user-TBI therapeutic alliance. Digital technology experience is likely to be crucial; those who are less familiar and comfortable using digital technology may require more from a TBI to establish credibility and trust, for example. As such, it may be inappropriate to apply the findings of my thesis to groups of people with very limited experience or comfort using technology, who may experience different challenges when attempting to establish a therapeutic alliance with a TBI.

The exploratory findings of this study still contribute usefully to research in the field of TBIs and therapeutic alliance, as qualitative research primarily aims to understand social processes rather than attain statistical representativeness (Mays & Pope, 1995). Instead, it can be meaningful to ask about relevance and worth as an indicator of quality in qualitative research – "was this piece of work worth doing? Has it contributed usefully to knowledge?" (Mays & Pope, 2000, p. 52). Considering that my interview sample included people with a wide range of TBI experiences and

clinical issues, and that the field of research about therapeutic alliance in TBIs is still emerging, I conclude that this qualitative exploratory study was certainly worth doing. Additional research could be done with other groups to explore their engagement and alliance experiences, to continue on this path towards building a picture of the user-TBI therapeutic alliance.

5.4.2.2 Author reflection on the interview and analysis process

I would also like to offer some reflections on the process of conducting a qualitative interview project as a novice researcher. As a postgraduate student, with limited prior experience of qualitative research, running a qualitative project and undertaking interviews was nerve-wracking. However, it was ultimately a steep learning curve that I am hugely grateful for. I had concerns that the unusual nature of the project might make interviewing difficult, and expected there was a chance that participants might not be willing to engage with "odd" questions about their relationship with digital technology. However, all the interviews resulted in some extremely fascinating discussions about the concept of a relationship with a TBI. Even where people did answer flatly reject the notion of having a relationship with it, they offered detailed insight in follow-up questions about why that was.

As a postgraduate student in my mid-twenties. I also acknowledge that I have grown up with technology and the internet permeating many areas of my life, and thus I may be more inclined towards a positive perception of technology than the average person. In attempting to mitigate against this potential bias, I endeavoured to ask questions as openly as possible. I was mindful that my positive perceptions of technology could come through in the way I spoke, and was careful that I gave participants' expressions of negative experience equal time and attention to those expressions of positive experiences. When trying to obtain more information about participants' experiences, I tried to reflect back what participants had said to me (perhaps using their own language) and tried to avoid putting my own interpretation over their meaning whilst interviewing.

However, as a novice, I acknowledge the impact my limited experience in interviewing has potentially had on the data. For instance, I was concerned about receiving very brief responses from some participants and, with reflection, I feel that I made some assumptions about the amount they would speak during an interview.

Whilst listening back to the audio and transcribing, I noticed that I sometimes showed a tendency to prematurely "fill the silence" and accidentally cut into participants' on occasion. Following each interview, I reflected upon my performance and made conscious efforts to improve my skills during the next interview. For example, I feel I became more comfortable with long pauses in interviews following these reflections and discussions with my supervisors, and I am hopeful that my status as a novice did not have an extreme impact upon our data quality.

I would also like to reflect on the quality of the data obtained by email interviews. There have been some concerns that email interview data might lose depth and richness (Bjerke, 2010) and I anticipated the possibility of briefer and less informative data. However, this was largely not my experience, as many responses from participants remained rich and detailed, and evidenced clear effort made by participants to type. Not all responses were particularly lengthy though, and sometimes required several follow-up questions to elaborate. However, the information provided was still highly relevant to the research questions, and was essentially just more tightly focused. This is not entirely unexpected; for many, a higher degree of effort is required to type something rather than to say it, and people may be unlikely to use more words than necessary to express their experience. I conclude that what may be lost with regard to data volume, is made up for by the answering of questions with a clearer focus and relevance. Email interview participants did feed back that participating via email allowed them to reflect upon their answer before responding, and it was easier to write down how they felt. This was not only the case for participants; as I was a relative newcomer to qualitative research, having added time to think about question wording and how to follow-up on participants' answers was incredibly beneficial.

My limited qualitative research experience also meant that the process of analysis was both insightful and challenging. For example, when beginning to code the transcripts, I found it initially difficult to grasp exactly constituted a "code" and what constituted a "theme". As Braun and Clarke (2006) point out, there is often ambiguity when deciding what counts as a theme, and the most important consideration is whether the information is key for answering your research questions. With incredibly valuable discussion with my supervisors and practice over

time, it became easier to clearly demarcate codes and themes, and move between descriptive and interpretative levels of analysis. I also feel that the use of a strictly outlined analysis strategy such as Braun and Clarke's (2006) approach to thematic analysis, facilitated my analysis of the qualitative interview data.

5.4.3 Further research

Some possible suggestions for further research have already been made in the sections above; they are briefly summarised here as a recap:

- Further attention regarding the role of "client initiative" as an alliance component.
- More research about which client and treatment factors are facilitative or detrimental to the therapeutic alliance in TBIs.
- Investigations about the relationship between therapeutic alliance, engagement, and TBI outcomes.
- What is the relationship between treatment satisfaction and therapeutic alliance in TBIs?
- A more detailed consideration of the triadic aspects of alliance (alliance between the user, TBI, and supporter), and relatedly, the impact of embedding TBIs as part of face-to-face treatment on therapeutic alliance.
- A systematic review which examines qualitative for patient experience studies through the lens of therapeutic alliance theory.
- A meta-analysis about the association between alliance and outcomes in TBIs, when sufficient research has been conducted under heterogeneous circumstances to permit this.
- Qualitative work with groups other than White British people, and those without a pre-existing high degree of digital technology experience or familiarity.

5.4.3.1 Improved reporting of TBI features

There is a need for future research to improve the reporting of TBIs in terms of detailed reporting of their functions and features. This is important for TBI developers and those implementing TBIs into health services, because conclusions

can start to be drawn about the type of TBI features which can alliance, and improvements to TBI outcomes could result.

Attempts to improve the reporting of online health interventions have been made; for example, the CONSORT-EHEALTH checklist (Eysenbach & Consort E-Health Group, 2011). This checklist asks that authors cover TBI details, for example: delivery mode; treatment rationale; use of reminders; and human support provided etc. Additionally, the comprehensive Enlight checklist (Baumel et al., 2017) focuses on a TBI's ability to promote user engagement and behaviour change by the use of persuasive design features, and those designed to enhance therapeutic alliance (for example: showing acceptance and support to the user; fostering positive therapeutic expectations; and relatability through use of human characters).

Given the broad scope of these checklists, and there could be different groups of TBI features which support engagement or alliance differently. For instance, a feature for improving users' motivation might be the use of feedback; this is rated in Enlight under the "therapeutic persuasiveness" section, which was associated with the presence of therapeutic alliance features (Baumel et al., 2017). Furthermore, research has found that regular prompts can be effective in promoting behaviour change in online interventions (Fry & Neff, 2009). Similarly, some features might support technical engagement (e.g. time spent on the site, log-in frequency) with the program; for instance, the ease of navigation, as assessed by the "usability" dimension of Enlight (Baumel et al., 2017). Some features may specifically foster a sense of therapeutic relatedness, such as attempts to demonstrate understanding and empathy, which is assessed with the therapeutic alliance section of the Enlight (Baumel et al., 2017).

These different groups of features might influence parts of the alliance differently. For example, attempts to show understanding might associate particularly with the "bond" quality of the alliance. This would be a useful area of future research. It is encouraging to see attempts to improve our knowledge about the role of specific features in user engagement with TBIs.

5.4.3.2 Further qualitative research

As aforementioned, there is a need to explore a greater diversity of perspectives in detail regarding the therapeutic alliance in TBIs. A qualitative

approach that might be enlightening is the "think aloud" method. In think-aloud methods, participants verbally describe their cognitive processes during a task; the rationale is that self-reports of cognitive processes are expected to be more accurate when coming from the short-term memory, compared to the long-term memory (Ericsson & Simon, 1980). It has also been suggested that think-aloud methods can reduce interviewer bias, as the process involves fewer interviewer interjections (Willis, 2004). Such an approach has been used in a TBI study; the paper by Serowik et al. (2014) that was included in the systematic review did this to explore users' experiences with a TBI. However, it did not necessarily take an alliance-centred approach to the method, or analyse the data with therapeutic alliance in mind. This could be useful to further understand the nature of the therapeutic alliance with a TBI as it is being established in real-time.

5.4.3.3 Developing new therapeutic alliance measures

As concluded by the systematic review and qualitative interview papers, there is a need for a therapeutic alliance measure for TBIs. There have been multiple attempts to adapt existing therapeutic alliance measures so that the items apply to the TBI itself, rather than a therapist (for example, Berger et al., 2014; Clarke et al., 2016; Kiluk et al., 2014). Puzzlingly, it is frequently found that there is no association between the user-TBI alliance and the TBI's outcomes, as illuminated by the present systematic review. This is entirely at odds with research on face-to-face therapies, which finds a consistent alliance-outcome link (for example, Horvath et al., 2011), and findings that suggest alliance is associated with outcomes in e-therapy, where a client and therapist communicate via technology such as email or videoconferencing (Sucala et al., 2012). This lack of an alliance-outcome link in TBIs could be because therapeutic alliance is not as influential for outcomes in TBIs in the way that it is for other forms of therapy (Ormrod et al., 2010).

Alternatively, the lack of an alliance-outcome link could be due to measurement issues. The use of therapeutic alliance measures which have been developed in a different context (i.e. face-to-face therapy) may be limiting our ability to discover this link, by not adequately capturing elements of the alliance which are relevant to TBIs (Clarke et al., 2016). To examine whether the lack of alliance link is in fact due to issues in existing measures, there is a need to create *new* measures of

the therapeutic alliance for TBIs, constructed in and for this therapeutic context. The findings of the systematic review suggest the possibility of ARM (Agnew-Davies et al., 1998) dimensions (for example, confidence and openness) being relevant, which is interesting considering that most measure adaptations for TBIs have been on versions of the Working Alliance Inventory (WAI; Horvath & Greenberg, 1989). The systematic review also suggested two possible new dimensions (interactivity and availability), which new measures of the alliance should aim to take account of. A key suggestion of the qualitative findings that personalisation is vital for engagement can also be of use when attempting to create such measures.

Perhaps a useful starting point would be to bring all possible alliance factors together in one exhaustive measure of the user-TBI alliance, and conduct psychometric and factor analyses to examine which dimensions are the most relevant and valid for alliance in TBIs. This would help us understand the underlying structure of the therapeutic alliance in TBIs with greater clarity, and would provide us with a way to measure its strength and quantitative associations with other variables. We could then conclude whether the lack of an alliance-outcome link is due to methodological issues arising from the use of conceptually inappropriate measures, or if the therapeutic alliance genuinely is not associated with the TBI effectiveness. If this is the case, it might be that alliance is not a mechanism of change in TBIs in the way it is in face-to-face therapy.

However, as noted above, people are often reluctant to consider their interactions with technology in terms of being a "relationship", despite evidence from their discussions that this may be the case. Considering that the concept of a "relationship" with a TBI may not usually have face validity for TBI users, it is apparent that there will be challenges in creating new alliance measures due to potential issues of terminology. Creating new measures with full involvement of users is a key recommendation from this paper for future research on the alliance, to ensure that the phrasing and wording of items makes sense to those that will actually be completing the questionnaire, and not just those within the academic community. There is little value in developing a new alliance measure that holds no meaning for TBI users, as it will be unable to tap into users' alliance experiences.

5.4.3.4 Experimental designs in alliance research?

Another interesting avenue for alliance research in TBIs could be the use of more experimental designs. Hekler et al. (2016) note the importance of experimental strategies for advancing our understanding of digital interventions; taking an experimental approach would allow for the outlining and testing of defined hypotheses and relationships between the different components that are manipulated and the outcome. Experimental designs have been used in previous alliance research; for example, the study by Fuentes et al. (2014), who provided either enhanced or limited therapeutic alliance to people receiving inferential current therapy for chronic pain. It was found that providing an enhanced therapeutic alliance was as beneficial as the therapy provided for pain modulation.

With regard to experimental designs in TBI research, certain features that are hypothesised to foster or be indicative of a therapeutic alliance (for example, a high degree of personalisation) could be provided in one version of a TBI and excluded in another. Participants could be allocated to receive differing versions of these interventions and then rate them for its alliance quality, which would help us to be more certain about the types of features which promote therapeutic alliance between a user and a TBI for mental health problems. Considering the limited knowledge about factors that influence an alliance as illustrated by the systematic review, this could be particularly fruitful for understanding the nature of user-TBI alliances.

5.4.4 Conclusion

This thesis was primarily concerned with exploring the nature of the therapeutic alliance in TBIs for mental health problems. I conclude that people *are* experiencing a therapeutic alliance with the digital technology that they are using for their mental health, which largely contains similar dimensions to the alliance in face-to-face therapy. However, considering how strange the notion of a "relationship" with a piece of technology was, the main challenge facing alliance research going forward is: how do we talk about this user-TBI alliance? Which terminology will be acceptable to participants in the design of future alliance measures? It is likely that digital technology will continue to be used and researched in mental health care, and a further understanding of the processes underlying treatment engagement will be invaluable for improving the provision of services.

General search terms used across databases:

Alliance words: "therapeutic relationship" OR "therapeutic alliance" OR "working alliance" OR "helping alliance" OR "therapy relationship" OR "working relationship" OR "human-computer interaction" OR "human-technology interaction"

AND

Online words: Internet OR "web-based" OR "web based" OR website OR webpage OR "web page" OR computer* OR iCBT OR cCBT OR technolog* OR online OR digital OR mhealth OR "mobile phone" OR "cell phone" OR smartphone OR "mobile app" OR "mobile application" OR "phone app" OR "phone application" OR "CD-ROM" OR "e-therapy" OR "e-health" OR "ehealth"

AND

Intervention words: intervention OR treatment OR therapy OR psychotherapy OR "cognitive behavioural therapy" OR "cognitive behavioral therapy" OR CBT OR mindful* OR "acceptance-based" OR "acceptance based" OR "acceptance and commitment" OR ACT OR psychoeducation* OR "psycho-education*" OR "self-help" OR "self-guided" OR "self-directed" OR "self help" OR "self guided" OR "self directed"
("acceptance and commitment" removed for PubMed as it causes errors)

AND

Mental health words/filters – see individual database strategies below

PsycINFO

Alliance words – all text
Online words – abstract field
Intervention words – abstract field
Mental health words – PsycINFO uses thesaurus terms, chose the following as relevant: mental health, mental health services, psychiatry, abnormal psychology, clinical psychology, mental disorders, psychopathology, treatment, self help techniques (where possible, the terms were "exploded" to cover all the narrower terms underneath these headings – can't explode abnormal psychology). [combined using OR]

Copy and pasted search strategy:
((((((((DE "Mental Health" OR DE "Community Mental Health") OR (DE "Mental Health Services" OR DE "Community Mental Health Services")) OR (DE "Psychiatry" OR DE "Adolescent Psychiatry" OR DE "Biological Psychiatry" OR DE "Child Psychiatry" OR DE "Community Psychiatry" OR DE "Consultation Liaison Psychiatry" OR DE "Forensic Psychiatry" OR DE "Geriatric Psychiatry" OR DE "Neuropsychiatry" OR DE "Orthopsychiatry" OR DE "Social Psychiatry" OR

DE "Transcultural Psychiatry")) OR (DE "Abnormal Psychology")) OR (DE "Clinical Psychology" OR DE "Medical Psychology")) OR (DE "Mental Disorders" OR DE "Adjustment Disorders" OR DE "Affective Disorders" OR DE "Alexithymia" OR DE "Anxiety Disorders" OR DE "Autism" OR DE "Chronic Mental Illness" OR DE "Dementia" OR DE "Dissociative Disorders" OR DE "Eating Disorders" OR DE "Elective Mutism" OR DE "Factitious Disorders" OR DE "Gender Identity Disorder" OR DE "Hysteria" OR DE "Impulse Control Disorders" OR DE "Koro" OR DE "Mental Disorders due to General Medical Conditions" OR DE "Neurosis" OR DE "Paraphilias" OR DE "Personality Disorders" OR DE "Pervasive Developmental Disorders" OR DE "Pseudodementia" OR DE "Psychosis" OR DE "Schizoaffective Disorder")) OR (DE "Psychopathology" OR DE "Adolescent Psychopathology" OR DE "Child Psychopathology")) OR (DE "Treatment" OR DE "Adjunctive Treatment" OR DE "Adventure Therapy" OR DE "Aftercare" OR DE "Alternative Medicine" OR DE "Behavior Modification" OR DE "Bibliotherapy" OR DE "Cognitive Techniques" OR DE "Computer Assisted Therapy" OR DE "Creative Arts Therapy" OR DE "Crisis Intervention Services" OR DE "Cross Cultural Treatment" OR DE "Disease Management" OR DE "Health Care Services" OR DE "Hydrotherapy" OR DE "Interdisciplinary Treatment Approach" OR DE "Involuntary Treatment" OR DE "Language Therapy" OR DE "Life Sustaining Treatment" OR DE "Medical Treatment (General)" OR DE "Milieu Therapy" OR DE "Movement Therapy" OR DE "Multimodal Treatment Approach" OR DE "Multisystemic Therapy" OR DE "Online Therapy" OR DE "Outpatient Treatment" OR DE "Pain Management" OR DE "Partial Hospitalization" OR DE "Personal Therapy" OR DE "Physical Treatment Methods" OR DE "Preventive Medicine" OR DE "Psychotherapeutic Techniques" OR DE "Psychotherapy" OR DE "Rehabilitation" OR DE "Relaxation Therapy" OR DE "Sex Therapy" OR DE "Social Casework" OR DE "Sociotherapy" OR DE "Speech Therapy" OR DE "Symptoms Based Treatment" OR DE "Treatment Guidelines")) OR (DE "Self Help Techniques" OR DE "Self Management")) AND TX ("therapeutic relationship" OR "therapeutic alliance" OR "working alliance" OR "helping alliance" OR "therapy relationship" OR "working relationship" OR "human-computer interaction" OR "human-technology interaction") AND AB (Internet OR "web-based" OR "web based" OR website OR webpage OR "web page" OR computer* OR iCBT OR cCBT OR technolog* OR online OR digital OR mhealth OR "mobile phone" OR "cell phone" OR smartphone OR "mobile app" OR "mobile application" OR "phone app" OR "phone application" OR "CD-ROM" OR "e-therapy" OR "e-health" OR "ehealth") AND AB (intervention OR treatment OR therapy OR psychotherapy OR "cognitive behavioural therapy" OR "cognitive behavioral therapy" OR CBT OR mindful* OR "acceptance-based" OR "acceptance based" OR "acceptance and commitment" OR ACT OR psychoeducation* OR "psycho-education*" OR "self-help" OR "self-guided" OR "self-directed" OR "self help" OR "self guided" OR "self directed")

PubMed

Alliance words – all fields
Online words – title/abstract field
Intervention words – title/abstract field
Mental health words – using PubMed's MeSH terms, specifically chose the following as relevant: mental health, mental health services, community mental health services, mental disorders, psychological techniques, psychotherapy, psychiatry, clinical psychology, psychopathology (these terms cover the more specific diagnoses as well, as these are lower in the hierarchy) [combined using OR]

Copy and pasted search strategy:
(((((((((((("Mental Health"[Mesh]) OR "Mental Health Services"[Mesh]) OR "Community Mental Health Services"[Mesh]) OR "Mental Disorders"[Mesh]) OR "Psychological Techniques"[Mesh]) OR "Psychotherapy"[Mesh]) OR "Psychiatry"[Mesh]) OR "Psychology, Clinical"[Mesh]) OR "Psychopathology"[Mesh])) AND ("therapeutic relationship" OR "therapeutic alliance" OR "working alliance" OR "helping alliance" OR "therapy relationship" OR "working relationship" OR "human-computer interaction" OR "human-technology interaction")) AND (Internet[Title/Abstract] OR "web-based"[Title/Abstract] OR "web based"[Title/Abstract] OR website[Title/Abstract] OR webpage[Title/Abstract] OR "web page"[Title/Abstract] OR computer*[Title/Abstract] OR iCBT[Title/Abstract] OR cCBT[Title/Abstract] OR technolog*[Title/Abstract] OR online[Title/Abstract] OR digital[Title/Abstract] OR mhealth[Title/Abstract] OR "mobile phone"[Title/Abstract] OR "cell phone"[Title/Abstract] OR smartphone[Title/Abstract] OR "mobile app"[Title/Abstract] OR "mobile application"[Title/Abstract] OR "phone app"[Title/Abstract] OR "phone application"[Title/Abstract] OR "CD-ROM"[Title/Abstract] OR "e-therapy"[Title/Abstract] OR "e-health"[Title/Abstract] OR "ehealth"[Title/Abstract])) AND (intervention[Title/Abstract] OR treatment[Title/Abstract] OR therapy[Title/Abstract] OR psychotherapy[Title/Abstract] OR "cognitive behavioural therapy"[Title/Abstract] OR "cognitive behavioral therapy"[Title/Abstract] OR CBT[Title/Abstract] OR mindful*[Title/Abstract] OR "acceptance-based"[Title/Abstract] OR "acceptance based"[Title/Abstract] OR ACT[Title/Abstract] OR psychoeducation*[Title/Abstract] OR "psycho-education*"[Title/Abstract] OR "self-help"[Title/Abstract] OR "self-guided"[Title/Abstract] OR "self-directed"[Title/Abstract] OR "self help"[Title/Abstract] OR "self guided"[Title/Abstract] OR "self directed"[Title/Abstract])

Academic Search Complete

Alliance words – all text
Online words – abstract field

Intervention words – abstract field

Mental health words – this database uses Subject Terms, chose the following: mental health; psychiatry; pathological psychology; self-help techniques; mental health services; psychotherapy (these terms cover the more specific diagnoses as well, as these are lower in the hierarchy) (exploded where possible, combined with OR)

Copy and pasted search strategy:

((((((DE "MENTAL health" OR DE "CHILD mental health" OR DE "INTERVIEWING in mental health" OR DE "MENTAL competency (Law)" OR DE "MENTAL health & social status" OR DE "ORTHOPSYCHIATRY" OR DE "PERSONALITY" OR DE "RELAXATION (Health)" OR DE "SCHOOL employees -- Mental health" OR DE "SELF-actualization (Psychology)" OR DE "SOCIAL psychiatry" OR DE "STRESS (Psychology)" OR DE "STRESS management" OR DE "VOLUNTEER workers in mental health") OR (DE "PSYCHIATRY" OR DE "ADOLESCENT psychiatry" OR DE "BIOLOGICAL psychiatry" OR DE "CHILD psychiatry" OR DE "CLINICAL psychology" OR DE "COMMUNICATION in psychiatry" OR DE "COMMUNITY psychiatry" OR DE "CONSULTATION-liaison psychiatry" OR DE "ECOPSYCHIATRY" OR DE "ELECTRONICS in psychiatry" OR DE "FORENSIC psychiatry" OR DE "GERIATRIC psychiatry" OR DE "INDUSTRIAL psychiatry" OR DE "MENTAL illness -- Treatment" OR DE "MILITARY psychiatry" OR DE "NEUROPSYCHIATRY" OR DE "ORTHOPSYCHIATRY" OR DE "PEER review in psychiatry" OR DE "PHOTOGRAPHY in psychiatry" OR DE "PSYCHIATRIC emergencies" OR DE "PSYCHIATRIC errors" OR DE "PSYCHIATRIC somatic therapies" OR DE "PSYCHIATRIC treatment" OR DE "PSYCHIATRY & literature" OR DE "PSYCHIATRY & the humanities" OR DE "PSYCHOTHERAPY" OR DE "SOCIAL psychiatry" OR DE "TELEVISION in psychiatry")) OR (DE "PATHOLOGICAL psychology" OR DE "ACTING out (Psychology)" OR DE "ADJUSTMENT disorders" OR DE "ADOLESCENT psychopathology" OR DE "AFFECTIVE disorders" OR DE "ATTACHMENT disorder" OR DE "BEHAVIOR disorders in children" OR DE "BRAIN damage" OR DE "CAIN complex" OR DE "CHILD psychopathology" OR DE "CODEPENDENCY" OR DE "COGNITION disorders" OR DE "COMPLEXES (Psychology)" OR DE "COMPULSIVE behavior" OR DE "CONDUCT disorders in adolescence" OR DE "CULTURE-bound syndromes" OR DE "DELUSIONS" OR DE "DEPERSONALIZATION" OR DE "DISPLACEMENT (Psychology)" OR DE "DISSOCIATIVE disorders" OR DE "DOUBLE bind (Psychology)" OR DE "DUAL-brain psychology" OR DE "EATING disorders" OR DE "ELECTRA complex" OR DE "EMOTIONAL incest" OR DE "EMOTIONAL trauma" OR DE "FEAR of death" OR DE "FLIGHT of ideas" OR DE "FORMES frustes (Psychiatry)" OR DE "IMPULSE control disorders" OR DE "LATAH (Disease)" OR DE "MAGGID (Cabala)" OR DE "MENTAL illness" OR DE "MENTAL illness -- Moral & ethical aspects" OR DE "MENTAL retardation" OR DE "MONOMANIA" OR DE "MYTHOMANIA" OR DE "NARCISSISM" OR DE

"NEGATIVISM" OR DE "NEUROSES" OR DE "NEUROTICISM" OR DE "OEDIPUS complex" OR DE "OLFACTORY reference syndrome" OR DE "PANIC disorders" OR DE "PERCEPTUAL disorders" OR DE "PERSONALITY disorders" OR DE "POSTPARTUM psychiatric disorders" OR DE "PSYCHOSES" OR DE "PSYCHOSEXUAL disorders" OR DE "PSYCHOSOMATIC medicine" OR DE "RIGIDITY (Psychology)" OR DE "SELECTIVE mutism" OR DE "SELF-destructive behavior" OR DE "SELF-injurious behavior" OR DE "SELFLESSNESS (Psychology)" OR DE "SLEEP disorders" OR DE "SOMATOFORM disorders" OR DE "SPLITTING (Psychology)" OR DE "STEREOTYPY (Psychiatry)" OR DE "STUPOR" OR DE "SUBSTANCE abuse")) OR (DE "SELF-help techniques" OR DE "AFFIRMATIONS" OR DE "SELF-management (Psychology)" OR DE "SELF-talk" OR DE "TWELVE-step programs")) OR (DE "MENTAL health services" OR DE "BIPHOBIA in mental health services" OR DE "CHILD mental health services" OR DE "COMMUNITY mental health services" OR DE "CRISIS intervention (Mental health services)" OR DE "DISCRIMINATION in mental health services" OR DE "GENDERISM in mental health services" OR DE "HALFWAY houses" OR DE "HETEROSEXISM in mental health services" OR DE "HOMOPHOBIA in mental health services" OR DE "HOSPITALS -- Substance abuse services" OR DE "MANAGED mental health care" OR DE "MENTAL health consultation" OR DE "MENTAL health counseling" OR DE "MENTAL health facilities" OR DE "MENTAL health promotion" OR DE "MENTAL health screening" OR DE "PREVENTIVE mental health services" OR DE "PSYCHIATRIC hospital care" OR DE "PSYCHIATRIC treatment" OR DE "PSYCHOTHERAPY" OR DE "RURAL mental health services" OR DE "SCHOOL mental health services" OR DE "SEXISM in mental health services" OR DE "SUICIDE prevention" OR DE "TRANSPHOBIA in mental health services")) OR (DE "PSYCHOTHERAPY" OR DE "ADOLESCENT psychotherapy" OR DE "ADVENTURE therapy" OR DE "ANGER management therapy" OR DE "ART therapy" OR DE "ASSERTIVENESS training" OR DE "ASTROLOGY & psychotherapy" OR DE "AUDIOTAPES in psychotherapy" OR DE "AUTOGENIC training" OR DE "AVERSION therapy" OR DE "BEHAVIOR therapy" OR DE "BIBLIOTHERAPY" OR DE "BIOFEEDBACK training" OR DE "BRIEF psychotherapy" OR DE "CHILD psychotherapy" OR DE "CLIENT-centered psychotherapy" OR DE "COGNITIVE therapy" OR DE "COMMUNICATIVE psychotherapy" OR DE "CONJOINT therapy" OR DE "DESENSITIZATION (Psychotherapy)" OR DE "DEVELOPMENTAL therapy" OR DE "DOLPHIN-assisted therapy" OR DE "DRAMA therapy" OR DE "DUAL-brain therapy" OR DE "ECLECTIC psychotherapy" OR DE "EMOTION-focused therapy" OR DE "EMOTIONAL Freedom Techniques" OR DE "ENVIRONMENTAL psychology" OR DE "EQUINE-assisted therapy" OR DE "ERHARD seminars training" OR DE "ETHICAL therapy" OR DE "EXISTENTIAL psychotherapy" OR DE "FAMILY staging" OR DE "FEELING therapy" OR DE "FEMINIST therapy" OR DE "FREE association (Psychology)" OR DE "GESTALT therapy" OR DE "GRIEF therapy" OR DE "GROUP psychotherapy" OR DE "HUMANISTIC psychotherapy" OR DE "IMPASSE

(Psychotherapy)" OR DE "INSIGHT in psychotherapy" OR DE "INTENSIVE psychotherapy" OR DE "INTERPERSONAL & social rhythm therapy" OR DE "INTERPERSONAL psychotherapy" OR DE "INTERVIEWING in psychiatry" OR DE "LOGOTHERAPY" OR DE "MILIEU therapy" OR DE "MIND & body therapies" OR DE "MORITA psychotherapy" OR DE "MOTION pictures in psychotherapy" OR DE "MULTIMODAL psychotherapy" OR DE "MULTIPLE psychotherapy" OR DE "NAIKAN psychotherapy" OR DE "NARCOTHERAPY" OR DE "NARRATIVE therapy" OR DE "NEUROLINGUISTIC programming" OR DE "OCCUPATIONAL therapy" OR DE "PERSONAL construct therapy" OR DE "PHILOSOPHICAL counseling" OR DE "PHOTOGRAPHY in psychotherapy" OR DE "POETRY therapy" OR DE "PRIMAL therapy" OR DE "PROBLEM-solving therapy" OR DE "PSYCHIATRY -- Differential therapeutics" OR DE "PSYCHODYNAMIC psychotherapy" OR DE "PSYCHOSURGERY" OR DE "PSYCHOSYNTHESIS" OR DE "PSYCHOTHERAPY & literature" OR DE "RADICAL therapy (Psychotherapy)" OR DE "REALITY therapy" OR DE "RECREATIONAL therapy" OR DE "REDECISION therapy" OR DE "REFRAMING (Psychotherapy)" OR DE "REINCARNATION therapy" OR DE "RELATIONAL-cultural therapy" OR DE "REMOTIVATION therapy" OR DE "RESISTANCE (Psychoanalysis)" OR DE "RESTRICTED environmental stimulation" OR DE "SEX therapy" OR DE "SHOCK therapy" OR DE "SOLUTION-focused therapy" OR DE "SPEYERMETHOD (Trademark)" OR DE "STRATEGIC therapy" OR DE "SUPPORTIVE psychotherapy" OR DE "SZONDI test" OR DE "TELECOMMUNICATION in psychotherapy" OR DE "TRANSACTIONAL analysis" OR DE "TRANSFERENCE (Psychology)" OR DE "TRANSPERSONAL psychotherapy" OR DE "TREATMENT contracts (Psychotherapy)" OR DE "VIDEO recording in psychotherapy" OR DE "VIDEO tapes in psychotherapy" OR DE "VIRTUAL reality therapy")) AND TX ("therapeutic relationship" OR "therapeutic alliance" OR "working alliance" OR "helping alliance" OR "therapy relationship" OR "working relationship" OR "human-computer interaction" OR "human-technology interaction") AND AB (Internet OR "web-based" OR "web based" OR website OR webpage OR "web page" OR computer* OR iCBT OR cCBT OR technolog* OR online OR digital OR mhealth OR "mobile phone" OR "cell phone" OR smartphone OR "mobile app" OR "mobile application" OR "phone app" OR "phone application" OR "CD-ROM" OR "e-therapy" OR "e-health" OR "ehealth") AND AB (intervention OR treatment OR therapy OR psychotherapy OR "cognitive behavioural therapy" OR "cognitive behavioral therapy" OR CBT OR mindful* OR "acceptance-based" OR "acceptance based" OR "acceptance and commitment" OR ACT OR psychoeducation* OR "psycho-education*" OR "self-help" OR "self-guided" OR "self-directed" OR "self help" OR "self guided" OR "self directed")

Web of Science

Alliance words – topic search field (Web of Science doesn't allow to search abstract, full text etc)
Online words – topic field
Intervention words – topic field
Mental health words – Web of Science doesn't use MeSH or thesaurus terms, but instead has Web of Science categories which can be applied to focus results. Chose the following categories as having possible relevance to mental health: WC = (Computer Science, Interdisciplinary Applications OR Psychiatry OR Psychology OR Psychology, Applied OR Psychology, Clinical OR Psychology, Experimental OR Psychology, Multidisciplinary OR Psychology, Psychoanalysis OR Psychology, Social OR Substance Abuse)

Copy and pasted search strategy:
WC=(Computer Science, Interdisciplinary Applications OR Psychiatry OR Psychology OR Psychology, Applied OR Psychology, Clinical OR Psychology, Experimental OR Psychology, Multidisciplinary OR Psychology, Psychoanalysis OR Psychology, Social OR Substance Abuse)
AND
("therapeutic relationship" OR "therapeutic alliance" OR "working alliance" OR "helping alliance" OR "therapy relationship" OR "working relationship" OR "human-computer interaction" OR "human-technology interaction")
AND
(Internet OR "web-based" OR "web based" OR website OR webpage OR "web page" OR computer* OR iCBT OR cCBT OR technolog* OR online OR digital OR mhealth OR "mobile phone" OR "cell phone" OR smartphone OR "mobile app" OR "mobile application" OR "phone app" OR "phone application" OR "CD-ROM" OR "e-therapy" OR "e-health" OR "ehealth")
AND
(intervention OR treatment OR therapy OR psychotherapy OR "cognitive behavioural therapy" OR "cognitive behavioral therapy" OR CBT OR mindful* OR "acceptance-based" OR "acceptance based" OR "acceptance and commitment" OR ACT OR psychoeducation* OR "psycho-education*" OR "self-help" OR "self-guided" OR "self-directed" OR "self help" OR "self guided" OR "self directed")

Scopus

Alliance words – In Scopus, have to search for these in "title, abstract, keywords" field, as putting these terms in "all fields" still leads to nearly 2,500 records.
Online words – title, abstract, keywords field.
Intervention words - title, abstract, keywords field.
Mental health words – Scopus doesn't use MeSH/thesaurus terms, but papers can be refined to a particular subject area – refined to psychology and medicine (and excluding other disciplines such maths, engineering, agriculture etc).
Further limits – as Scopus produces so many results, I also used database tools to

exclude reviews and conference papers (see screening stages' inclusion/exclusion criteria).

Copy and pasted search strategy:
(TITLE-ABS-KEY ("therapeutic relationship" OR "therapeutic alliance" OR "working alliance" OR "helping alliance" OR "therapy relationship" OR "working relationship" OR "human-computer interaction" OR "human-technology interaction")) AND ((TITLE-ABS-KEY (internet OR "web-based" OR "web based" OR WEBSITE OR webpage OR "web page" OR computer* OR icbt OR ccbt OR technolog* OR online OR digital OR mhealth OR "mobile phone") OR TITLE-ABS-KEY ("cell phone" OR smartphone OR "mobile app" OR "mobile application" OR "phone app" OR "phone application" OR "CD-ROM" OR "e-therapy" OR "e-health" OR "ehealth"))) AND ((TITLE-ABS-KEY (intervention OR treatment OR therapy OR psychotherapy OR "cognitive behavioural therapy" OR "cognitive behavioral therapy" OR cbt OR mindful* OR "acceptance-based" OR "acceptance based") OR TITLE-ABS-KEY ("acceptance and commitment" OR act OR psychoeducation* OR "psycho-education*" OR "self-help" OR "self-guided" OR "self-directed" OR "self help" OR "self guided" OR "self directed")))

Appendix B: Data Extraction Forms

Data Extraction Table 1: Key Study Details

Authors	Year	Location	Mental health status of participants/ target of intervention Note any diagnostic criteria used	Participant details Sample size, age (mean and range), gender, nationality, ethnicity, marital status, education, employment, income, technology use, treatment history, medication Note: if only part of the sample is relevant (e.g. only 1/3 groups used a TBI), report statistics for this sample and also the overall sample.	Intervention details Intervention name, platform/ device, theoretical orientation, number of sessions, nature of support (e.g. duration, method of contact, type of supporter)	Key overall aims of paper	Study design	Data collection and analysis methods
Paper 1								
Paper 2 etc								

Data Extraction Table 2: Relevant Data from Primary Studies

(Some of the columns are relevant to only the qualitative papers or quantitative papers, and one is relevant to both. It was acceptable to fill cell with "no relevant data" if this was applicable)

	Conceptualisation of human-technology relationship How has it been operationalised or defined? Which terms/ concepts have the authors used? "Alliance" or "relationship"? Note: If authors have not given a definition of the term used, this is fine but should be noted. This column looks for a sense of what authors mean by terms such as alliance.	Source of relevant data regarding human-computer relationship E.g. participant quotes, author interpretations, questionnaire data? Where has the relevant data come from? Where is the interpretation from the authors?	Data relevant to Working Alliance theory – goal agreement dimension Note: In WA theory, this refers to the agreement between client and therapist on therapy goals.	Data relevant to Working Alliance theory – task agreement dimension Note: In WA theory, this refers to the agreement between client and therapist on the therapeutic tasks needed to achieve the client's goals.	Data relevant to Working Alliance theory – bond dimension Note: In WA theory, the bond element refers to the trust and quality of the interpersonal relationship between the therapeutic dyad.	Additional themes Other themes relevant to the human-computer relationship, above the WA theory dimensions. Is there any important data in the paper that is relevant to therapeutic alliance, but doesn't fit into the previous 3 columns?	How was the human-technology relationship measured? Note any adaptions made to the measure. How many items? How are the items rated?	Strength of the human-technology relationship E.g. For quant papers, note the mean measure score for the sample. Also note the range of possible scores, to give a context. Explain what a higher/ lower score means. Can also come from qual data – e.g. statements from participants that indicate a strong/weak sense of alliance.	Strength of association between human-technology relationship and outcomes E.g. For quant papers - How were outcomes measured? Which statistical test used? Strength of the association? P-value? Can also come from qual data – e.g. participant statements indicating a link between alliance and treatment outcome.	Associations between human-technology relationship and other variables/ factors influencing the human-computer relationship? In qual data, this may come from themes which discuss what influences or impacts upon the alliance. What makes alliance stronger or weaker? For quant papers, this may cover other variables which were measured. How were they measured? Which statistical test used? Strength of the association? P-value?
Paper 1										
Paper 2 etc										

<u>**Appendix C: Participant Information Sheet**</u>

Exploring users' experiences with technology-based mental health treatments

We would like to invite you to take part in a study about the experiences of people who have used technology-based treatments to improve their mental health. This information sheet has been designed to help you understand the study's purpose and what your participation would involve. Please read this carefully, and let us know if there is anything you are not sure about, or if you have any questions.

What is the study about?

The purpose of this study is to investigate the experiences of users of technology-based mental health treatments. Various treatments have been developed which might be accessed via technology such as a computer program, website, or smartphone application. These treatments may be offered as a form of self-help (i.e. with a small amount of support from a mental health professional). These treatments may help people to learn about their mental health, identify some coping strategies, or may involve other activities designed to help them improve their mental health. This research is studying how these treatments work to improve people's wellbeing. Particularly, we are interested in how users of technological treatments engage with and relate to the treatment. We would like to hear from you if you have used a technology-based treatment for your mental health in the last 6 months.

Who is organising the research?

This study is part of a PhD project by researchers at the Spectrum Centre for Mental Health Research, at Lancaster University. The research is funded by the Economics and Social Research Council and Cumbria Partnership NHS Foundation Trust. The Chief Investigator of the project is Laura Hillier, a PhD student at Lancaster University. The project is being supervised by Professor Fiona Lobban and Professor Steven Jones, who are co-directors of the Spectrum Centre and are qualified clinical psychologists. The project is also being supervised by Professor Dave Dagnan, a consultant clinical psychologist at Cumbria Partnership NHS Foundation Trust. To incorporate service user views into the design of a study, the research team also includes a service user advisory panel.

Who is able to take part in the study?

We would like to speak to 15-20 people who have used a particular type of technology-based mental health treatment. You must be at least 16 years old to take part. You need to have received a diagnosis of a mental health condition, and you also need experience of using a specific type of technology-based treatment for this condition. The type of treatment we are interested in are those that are mainly used on a "self-help" or "self-guided" basis. This means that although someone might help you to use the technology, you mostly work through the treatment yourself. You may have accessed this treatment via a website, computer program or a smartphone app. If you think you may fit the criteria, or if you aren't sure, then please get in touch. The Chief Investigator will phone you to talk to you about your circumstances, so

that we can check if you meet the criteria to take part.

Do I have to take part?
No, it's completely up to you to decide whether or not you want to take part. Any treatment or services you may be currently using will not be affected by your decision. You can also change your mind about taking part, and you can stop the interview at any time. If you would like to withdraw your data after taking part in the interviews, you will need to contact the research team within two weeks. After this time, it will not be possible to remove your data as analysis may have already started.

What will I be asked to do if I take part?
If you meet the criteria for the study and would like to participate, you will be asked to take part in an interview. You have a choice in how you have the interview - over the phone, via email, or face-to-face (depending on your location). If you choose the face-to-face or phone option, the interview is likely to last for around an hour, although this can vary from person-to-person. Face-to-face and phone interviews will be audio recorded to help with analysis. If you choose an email interview, it is likely to last several hours as we would need to send multiple email messages to each other. However, you can set the pace of these email interviews, as you have a maximum of 7 days to complete the interview.

These interviews will generally cover your experiences of using a technology-based treatment for your mental health. We will talk about whether the treatment was helpful for you and your mental health, what you did or didn't like about it, your feelings towards the treatment, and how you interacted with the technology. There are no right or wrong answers, so please feel free to answer the questions however you like.

To take part, you will need to provide contact details for your general practitioner or care co-ordinator. Contact with this person will only be made if there is a need to discuss or report any issues regarding risk of harm to yourself or others. Please note that if you ask for a home visit for your interview, the researcher is required to call this person to check any issues regarding safety.

You may also be asked if you would like to take part in future research at the Spectrum Centre. This would involve you giving the Spectrum Centre consent to hold your contact details so that we can let you know about research studies you may be interested in.

What will happen to my data?
Audio recordings of face-to-face or phone interviews made using a dictaphone will be transferred to an encrypted folder on the computer as soon as possible after the interview, and then deleted immediately from the dictaphone. Audio recordings will be typed up into a transcript version, which will be made anonymous by removing any identifying information such as your name. Audio recordings will be deleted from the computer once the findings have been submitted for examination or publication. If you choose an email interview, your original emails will be deleted

once your responses have been copied into a word document and anonymised as above. Anonymised direct quotations from your interview may be used in the reports or publications from the study, but your name will not be attached to them.

Only the research team conducting the study will have access to your data. All your personal data will be kept confidential, and kept separately from your interview responses. Personal data will be stored securely on the computer, and will be deleted once the interview and any follow-up contact is complete. However, you can indicate if you would like your contact details to be held so that we can let you know the study findings or inform you about future research projects. Any files stored on the computer will be password-protected and stored on Lancaster University's secure server. Computers used to access this data will themselves be password protected, and any laptops used to access this data will be encrypted. Hard copies of study documentation will be kept securely in a locked cabinet in a locked office at Lancaster University. Study data (e.g. interview transcripts, consent forms) will be held securely for 10 years at Lancaster University. This is to allow time for the research to be written up, as well as for secondary analysis on the data. At the end of this period, they will be destroyed.

Please be aware that there are some limits to confidentiality. If what is said in the interview makes the researcher think that you, or someone else, is at significant risk of harm, the researcher will have to break confidentiality and speak to her supervisor and maybe other professionals about this. If possible, she will tell you if she has to do this.

In the unlikely event that you lose capacity during the research, you will no longer be able to take part. However, we will retain data that you have already provided to us, storing it securely and confidentially.

What will happen to the results?
The results will be summarised and reported in a PhD thesis and may be submitted for publication in an academic or professional journal. Findings are published in the hope that the results of the study may help to improve our understanding of technology-based services for mental health. Presentations will also be made to various service user groups and mental health services to more widely publicise the findings. The study results will also be reported back to participants who indicate an interest in receiving them.

What are the risks and benefits of taking part?
There are no major risks anticipated with participating in this study. However, as the interview concerns services for mental health problems, it is possible that some people may become upset if sensitive topics are discussed during the interview. This is normal, and it is up to you entirely whether you want to take part. If you have any concerns, please contact the Chief Investigator or her supervisors. If you do experience any distress following participation you are encouraged to let us know, and contact the resources provided at the end of this sheet.

If you choose an email interview, we would like you to be aware that email is not always a 100% secure method of communication. We can discuss with you the

potential added risks of communicating this way, and explain some strategies to help you stay safe online. For example, as the interviews may cover sensitive information about mental health, it may be safer to send the emails when you are in a private place.

To thank you for your time, we would like to offer you a £10 voucher for taking part. If you would like a face-to-face interview and you would need to travel to the interview location, we are also able to refund reasonable travel costs. There are no other direct benefits from being involved in the study. However, some people do find research to be a valuable opportunity to share their views and opinions. We hope that your contributions will help to further our understanding and improvement of technology-based mental health treatments.

Who has reviewed the project?
This study has been reviewed and given ethical approval by the NHS London-Hampstead Ethics Committee.

What do I do if something goes wrong?
It is highly unlikely that taking part in this research will result in harm to you. In the event that something does go wrong and you are harmed during the research due to someone's negligence, you may have grounds for legal action for compensation against Lancaster University. However, you may have to pay your legal costs.

Where can I obtain further information about the study if I need it?
If you have any questions about the study, please either contact or return an Expression of Interest Form to the Chief Investigator:
Laura Hillier
l.hillier@lancaster.ac.uk
01524 595161 / 07548 801695
Spectrum Centre for Mental Health Research, Division of Health Research, Lancaster University, Lancaster, LA1 4YG

Alternatively, you may contact the supervisors of the researcher:

Professor Fiona Lobban	Professor Steven Jones
f.lobban@lancaster.ac.uk	s.jones7@lancaster.ac.uk
01524 593752	01524 593382
Spectrum Centre for Mental Health Research, Division of Health Research, Lancaster University, Lancaster, LA1 4YG	Spectrum Centre for Mental Health Research, Division of Health Research, Lancaster University, Lancaster, LA1 4YG

Complaints

If you wish to make a complaint or raise concerns about any aspect of this study and do not want to speak to the researcher or her supervisors, you can contact:
Professor Christine Milligan
Associate Dean for Postgraduate Studies
c.milligan@lancaster.ac.uk
01524 592128
Faculty of Health and Medicine (Division of Health Research), Lancaster University, Lancaster, LA1 4YG

If you wish to speak to someone outside of the PhD Health Research Programme, you may also contact:
Professor Roger Pickup
Associate Dean for Research
r.pickup@lancaster.ac.uk
01524 593746
Faculty of Health and Medicine (Division of Biomedical and Life Sciences), Lancaster University, Lancaster, LA1 4YG

Support resources

Should you feel distressed either as a result of taking part, or in the future, the following resources may be of assistance to you.

Samaritans	NHS 111/Direct
08457 90 90 90 (24 hours per day)	111 (24 hours per day)
www.samaritans.org	
jo@samaritans.org	
Rethink Mental Illness Advice Line	Saneline
0300 5000 927 (Open 10am-2pm Monday-Friday)	0300 304 7000 (Open 6pm-11pm 7 days per week)
www.rethink.org	www.sane.org.uk

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Appendix D: Project Flyer

Exploring users' experiences with technology-based mental health treatments

Technology is increasingly being used to support the delivery of treatments for mental health problems. We are interested in speaking to people that have used a technology-based treatment for their mental health in the past six months. This means a mental health treatment that has been provided via a computer, the internet, or perhaps a mobile phone. This research aims to find out more about people's experiences of using this type of treatment.

To do this, we would like to interview people about their experiences of using technology-based treatment. We are offering a £10 voucher for taking part, as a way of thanking participants for their time. Involvement in this study is entirely voluntary, and participants can withdraw at any time.

This project is part of a PhD project by researchers at the Spectrum Centre for Mental Health Research, at Lancaster University. The Chief Investigator of the project is Laura Hillier, a PhD student. The project is being supervised by Professor Fiona Lobban and Professor Steven Jones.

If you are interested in this study, please contact us using the details below. We can discuss the study and whether you are eligible to take part in more detail. Alternatively, if you know someone that might be interested, please pass this information on to them. If you have any questions, please feel free to contact us.

Chief Investigator:
Laura Hillier
l.hillier@lancaster.ac.uk
01524 595161 /07548 801695

Supervisors:
Professor Fiona Lobban   Professor Steven Jones
f.lobban@lancaster.ac.uk   s.jones7@lancaster.ac.uk

The research team is based at the Spectrum Centre for Mental Health Research, Division of Health Research, Lancaster University, Lancaster, LA1 4YG.

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Exploring users' experiences with technology-based mental health treatments

Participant number: _____

Thank you for your interest in our research project which is investigating the experiences of users of technology-based mental health treatments. If you have any questions or queries about the information sheet or what the study involves, please speak to the Chief Investigator, Laura Hillier. Before you consent to participating in the study, we ask that you mark each box below with your initials if you agree.

<div style="text-align:right">Please initial box after each statement</div>

1. I confirm that I have read the information sheet, understand what is expected of me within this study, and that I have had the opportunity to ask any questions. ☐

2. I understand that if I choose to have a face-to-face or phone interview, the interview will be audio recorded, and that these audio recordings will be kept securely on computers at Lancaster University until the data has been examined or published. I understand that my responses will be made into a written transcript with any identifying details removed. ☐

3. I understand that my participation is voluntary and that I am free to withdraw from the study without giving any reason. I understand that should I wish to withdraw after the interview, I should notify the researcher within two weeks to guarantee that my data can be removed. ☐

4. I understand that the information from my interview will be grouped with other participants' responses, with any identifying details removed. I consent to information and quotations from my interview being used in reports, conferences, and training events. ☐

5. I understand that any information I give will remain strictly confidential and anonymous within the research team, unless it is thought that there is a risk of harm to myself or others. I understand that in this case the Chief Investigator will need to share this information with her research supervisor and possibly other professionals. ☐

6. I consent to providing contact details for my general practitioner (GP) or care co-ordinator. I understand that contact with this person will only be made if there is a need to discuss or report any issues regarding risk of harm to myself or others.

☐

7. I consent to Lancaster University keeping interview transcripts and other written study documents for ten years after the study has finished. I understand that the data from my transcript may be revisited by the research team, for further or new analyses.

☐

8. **(Optional)** I consent to my contact details being held by the research team who can contact me about the study's results, and to inform me about further, related research being undertaken as part of the Chief Investigator's PhD.

☐

9. I consent to take part in the above study.

☐

_____   _____   _____
Name of Participant   Date   Signature

_____   _____   _____
Name of Researcher   Date   Signature

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Appendix F: Full Version of Interview Topic Guide

The following represents a full list of questions that may be asked during the qualitative interviews, to provide an extensive overview of the kind of questions that participants *may* be asked. Although the list below is lengthy, not all the questions will be asked of all participants, and not necessarily in the order shown. Questions will be asked in such a way as to maintain a natural flow of conversation, following up on participants' leads. Please also refer to the briefer version of this topic guide, which is the version that will be used to guide the interviews. However, the interview questions for all participants will broadly cover their experience with the intervention that they used, as well as more specific questions covering their interaction, engagement and potential alliance with the intervention. Participants may also be asked to provide a brief overview of any other services they have experienced. The term "intervention" is used throughout this topic guide, but when the type of intervention used by the participant becomes apparent (for example, a website, smartphone app), a more appropriate term will be used. Possible prompts have been removed from this version due to word count limits in the thesis, but can be obtained from the author on request.

Introductory section

- Overview of likely interview content and expected duration.
- Re-confirm consent.
- Explain confidentiality policy.
- Check if the participant has any questions.

Section 1: Understanding the participant's use of a particular intervention (context/background)

- Which intervention did you use, and how?
- Could you tell me a bit about why you were interested in trying out online/computerised/smartphone (use as appropriate) approaches to your mental health in the first place?
- Were there any specific reasons for choosing this particular intervention for your mental health?

Section 2: Experiences of using the intervention

- Broadly speaking, what was your general experience of using the intervention?
- What did you find helpful/not so helpful about the intervention?
- How easy was the intervention to use?
- Do you have any suggestions for how the intervention you used could be improved?

Section 3: Exploring interaction, engagement, and alliance

- **If frequent use of intervention (determined in Section 1)**: It seems like you used the intervention quite a few times. Can you tell me why you think that was?
- **If infrequent use of intervention (determined in Section 1)**: It seems as though you didn't use the intervention very often. Can you tell me a bit about why that was?
- How interactive was the intervention that you used?
- Did you have any initial aims or goals when you first started using the intervention? What were they?
- Before you started using the intervention, did you feel the intervention would be able to help you?
- Did the intervention help you to achieve these goals, or not? Why?
- If any, which features of the intervention particularly helped/didn't help you to achieve your goals?
- Before you started using the intervention, did you try to check the quality or trustworthiness of the intervention?
- How much control did you feel you had in choosing how to use the intervention?
- Did the intervention feel "personalised" in anyway?
- What was the general tone of the intervention?
- How did the intervention make you feel whilst you were using it?
- How did you feel after using the intervention?
- What do you think may have influenced your feelings towards the intervention/you had whilst using the intervention?
- Did you feel that the intervention "understood" you in any way?
- Did you feel any kind of *connection* to the intervention?
- Did this *connection* feel personal in any way?
- Feel free to answer this question however you feel - there are no right or wrong answers, as it may appear to be an unusual question. Did you feel any kind of relationship with the intervention you used?
    - **(if yes to question)** Can you describe this relationship for me? What made it feel like a relationship?
    - **(if no)** Why do you think this is?
    - Would you use the term "relationship", or is there another word you think is better?
- **If yes to the relationship question:** Did this relationship influence your experience or use of the intervention? How?
- **If yes to the relationship question:** We may have already covered this (**depending on answers to above questions**), but what do you think helped to influence this relationship?

- **If no to the relationship question:** If not a "relationship", how would you describe your *connection* with the intervention?
- This may also be quite an unusual question, so please answer however you like. If you've had face-to-face therapy before, can you describe to me the differences in the relationship/*connection*/*interaction* (depending on participant's terminology) with the intervention to a relationship with a human therapist?
- Did a health professional/therapist help you to use this intervention? How did this affect your use of the intervention?

Section 4: Use of other interventions & services, and closing

- Have you ever used any other technology-based interventions for your mental health, other than the one we've spoken about today? Could you briefly describe it to me?
- What was that intervention like compared to the one we've spoken about today?
- Have you experienced face-to-face mental health treatment **(If not already covered)**? Could you provide me with a brief overview of how that was?
- **(If yes to experiencing face-to-face treatment)** How did your experiences of face-to-face therapy and the intervention we talked about today differ?
- Do you have anything else that you would like to discuss?
- How was the interview for you?
- Do you have any questions for me?

Appendix G: Brief Version of Interview Topic Guide

This brief version of the topic guide will be used to guide the interviews. Whilst the full version contains an extensive list of potential questions, this diagrammatic version can be used more flexibly than a list of questions, and can be annotated during the interview. The arrows are provided as guidelines only; questions will be asked flexibly in a way which retains a natural, conversational flow. Please refer to the full version of the topic guide for more details regarding questions.
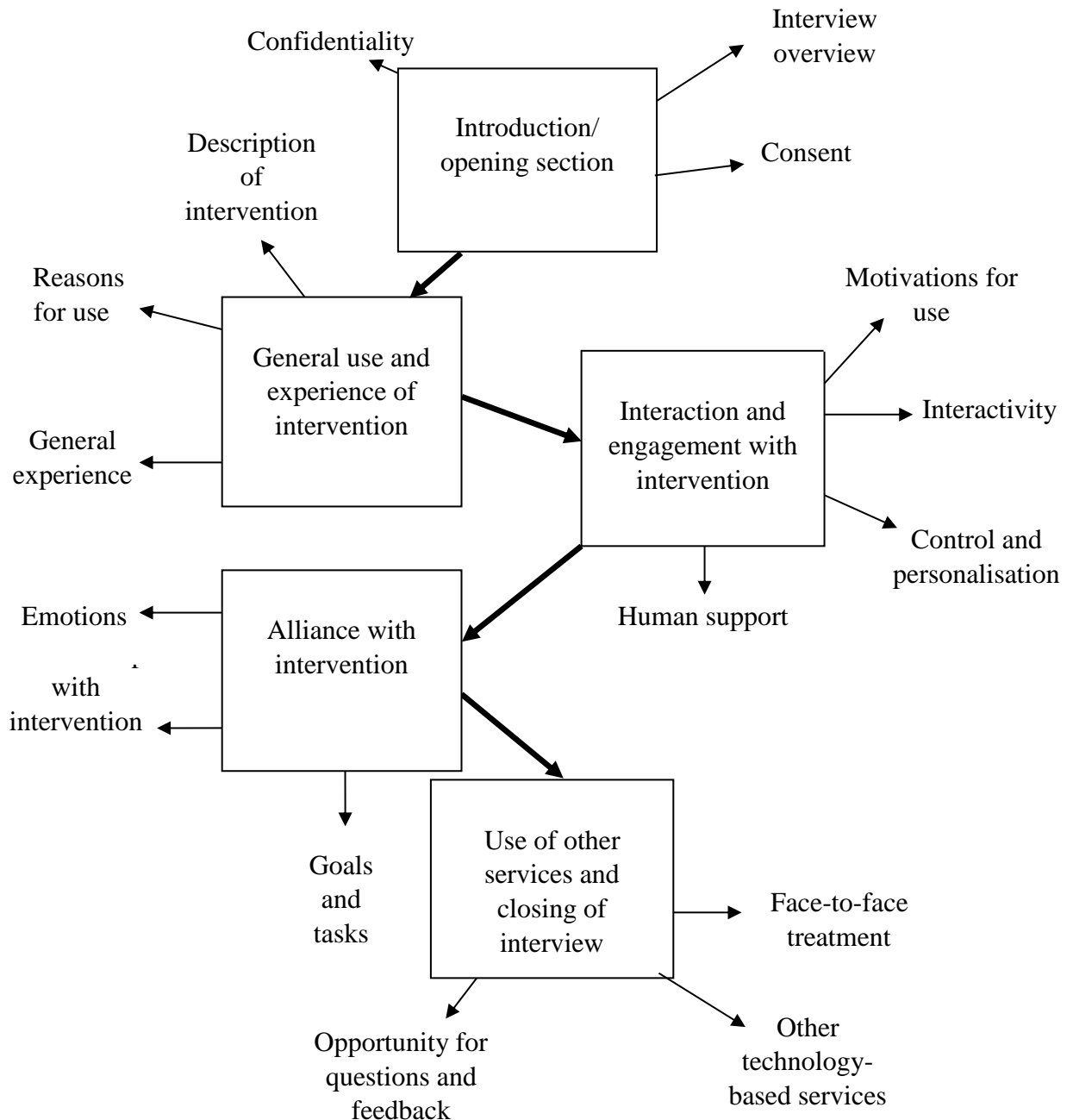
Appendix H: Tips for staying safe online

Thank you very much for your interest in this research. This document has been provided to you to explain how to increase your online security, if you choose to have your interview via email. During your interview, I will send you interview questions in a password-protected document. You will need to send your responses in this format too. This will increase security, and I will explain how to do this before we start the interview. Here are a few extra tips:

- Read and reply to the interview questions in a private place.
- Use passwords on your email account, and on the device you use to access your emails (for example, your laptop or mobile phone).
- Use a password that only you know.
- Make sure you log out of your email account when you are finished reading or replying to your emails.
- You are advised not to use a workplace email system, as employers may be legally entitled to access your emails.
- If possible, use an email address that doesn't contain any information that might identify you (such as your name).
- You are advised to delete the emails after the interview has finished.
- However, if you want to keep the emails after the interview has finished, store them more securely elsewhere. For example, you could copy the text and save it in a password protected document. I can explain how to do this for you, if you would like.

Even if all these steps are followed, email isn't a 100% secure method of sending information. For example, it may be possible for messages to be intercepted when they are sent between email addresses. It is important for you to know this so that you can make a decision about whether or not you would still like to have your interview in this way. Remember, it's also possible to have your interview over the phone or face-to-face.

Thank you for taking the time to read this information. Please feel free to contact me if you have any questions:
(Researcher Laura Hillier and supervisor contact information)

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Appendix I: Analysis Strategy Details

This table contains the full details of the thematic analysis strategy used in the qualitative interview study. The table has been taken and adapted from:

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in Psychology, 3*(2), 77-101.

Step	Details/aims of step
1: Familiarisation with data	Transcribing data, reading and re-reading the data, noting down initial ideas.
2: Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code. End phase with a collection of candidate themes and subthemes.
3: Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme. Consider the relationship between codes, themes and levels of themes.
4: Reviewing themes	Checking if the themes work in relation to the coded extracts at: Level 1 – read the extracts for each theme and to see whether they form a coherent pattern. Level 2 - does the thematic map reflect the meanings in the entire data set as a whole? Re-read entire dataset, check whether the story fits, and that nothing is missed. This stage results in a thematic 'map' of the analysis. Analysts can consider whether all the themes are "holding up" and whether substantial data exists to support them.
5: Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme. This stage produces a narrative for each theme.
6: Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating the analysis back to the research question and literature, producing a scholarly report of the analysis.

Appendix J: Quality Assessment

Adapted from the Mixed Methods Appraisal Tool (MMAT, see Pluye et al. 2009 for full version and criteria)

	Screening		Qualitative				Quantitative randomised controlled				Quantitative non-randomised				Quantitative descriptive				Mixed methods			Score
	SQ1	SQ2	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	5.1	5.2	5.3	
Berger et al. 2014	✓	✓					✓	✓	X	X												50%
Berman et al. 2014	✓	✓									X	✓	X	✓								50%
Clarke et al. 2016	✓	✓	✓	✓	X	X	✓	X	X	X									✓	✓	X	25%
Gega et al. 2013	✓	✓	✓	✓	✓	X									✓	X	✓	✓	✓	X	X	33%
Kiluk et al. 2014	✓	✓					✓	X	✓	✓												75%
Kiluk et al. 2016	✓	✓					✓	✓	✓	X												75%
Miragall et al. 2015	✓	✓									X	✓	X	Can't tell								25%
Morie et al. 2015	✓	✓					✓	X	X	X												25%
Ormrod et al. 2010	✓	✓									X	✓	X	X								25%
Purves & Dutton 2013	✓	✓	✓	✓	X	✓																75%
Richards et al. 2013	✓	✓					✓	X	X	X												25%

Study																			%
Scherer et al. 2016	✓	✓					✓	X	X	X									25%
Serowik et al. 2014	✓	✓	✓	✓	✓	X						X	X	✓	Can't tell	Can't tell	X	✓	25%

Criteria relevant to that paper will have either a ✓ or X – box left blank the criteria is not relevant.

Screening Questions (for all study types)

1: Are there clear qualitative and quantitative research questions (or objectives), or a clear mixed methods question (or objective)?

2: Do the collected data allow address the research question (objective)? E.g., consider whether the follow-up period is long enough for the outcome to occur (for longitudinal studies or study components).

Qualitative

1.1: Are the sources of qualitative data (archives, documents, informants, observations) relevant to address the research question (objective)?

1.2: Is the process for analyzing qualitative data relevant to address the research question (objective)?

1.3: Is appropriate consideration given to how findings relate to the context, e.g., the setting, in which the data were collected?

1.4: Is appropriate consideration given to how findings relate to researchers' influence, e.g., through their interactions with participants?

Quantitative randomised controlled (trials)

2.1: Is there a clear description of the randomization (or an appropriate sequence generation)?

2.2: Is there a clear description of the allocation concealment (or blinding when applicable)?

2.3: Are there complete outcome data (80% or above)?

2.4: Is there low withdrawal/drop-out (below 20%)?

<u>Quantitative non-randomised</u>

3.1: Are participants (organizations) recruited in a way that minimizes selection bias?

3.2: Are measurements appropriate (clear origin, or validity known, or standard instrument; and absence of contamination between groups when appropriate) regarding the exposure/intervention and outcomes?

3.3: In the groups being compared (exposed vs. non-exposed; with intervention vs. without; cases vs. controls), are the participants comparable, or do researchers take into account (control for) the difference between these groups?

3.4: Are there complete outcome data (80% or above), and, when applicable, an acceptable response rate (60% or above), or an acceptable follow-up rate for cohort studies (depending on the duration of follow-up)?

<u>Quantitative descriptive</u>

4.1: Is the sampling strategy relevant to address the quantitative research question (quantitative aspect of the mixed methods question)?

4.2: Is the sample representative of the population understudy?

4.3: Are measurements appropriate (clear origin, or validity known, or standard instrument)?

4.4: Is there an acceptable response rate (60% or above)?

<u>Mixed methods</u>

5.1: Is the mixed methods research design relevant to address the qualitative and quantitative research questions (or objectives), or the qualitative and quantitative aspects of the mixed methods question (or objective)?

5.2: Is the integration of qualitative and quantitative data (or results*) relevant to address the research question (objective)?

5.3: Is appropriate consideration given to the limitations associated with this integration, e.g., the divergence of qualitative and quantitative data (or results*) in a triangulation design?

Scoring

For qualitative and quantitative studies, this score can be the number of criteria met divided by four (scores varying from 25% (*) - one criterion met - to 100% (****) - all criteria met. For mixed methods research studies, the premise is that the overall quality of a combination cannot exceed the quality of its weakest component. Thus, the overall quality score is the lowest score of the study components.

Appendix K: Codes for the Included Papers

1 - Berger, T., Boettcher, J., & Caspar, F. (2014). Internet-based guided self-help for several anxiety disorders: A randomized controlled trial comparing a tailored with a standardized disorder-specific approach. *Psychotherapy (Chic), 51*(2), 207.

2 - Berman, M. I., Buckey, J. C., Jr., Hull, J. G., Linardatos, E., Song, S. L., McLellan, R. K., & Hegel, M. T. (2014). Feasibility study of an interactive multimedia electronic problem solving treatment program for depression: a preliminary uncontrolled trial. *Behav Ther, 45*(3), 358-375. doi: 10.1016/j.beth.2014.02.001

3 - Clarke, J., Proudfoot, J., Whitton, A., Birch, M.-R., Boyd, M., Parker, G., . . . Fogarty, A. (2016). Therapeutic alliance with a fully automated mobile phone and web-based intervention: secondary analysis of a randomized controlled trial. *JMIR Mental Health, 3*(1).

4 - Gega, L., Smith, J., & Reynolds, S. (2013). Cognitive behaviour therapy (CBT) for depression by computer vs. therapist: patient experiences and therapeutic processes. *Psychotherapy Research, 23*(2), 218-231.

5 - Kiluk, B. D., Serafini, K., Frankforter, T., Nich, C., & Carroll, K. M. (2014). Only connect: the working alliance in computer-based cognitive behavioral therapy. *Behav Res Ther, 63*, 139-146.

6 - Kiluk, B. D., Devore, K. A., Buck, M. B., Nich, C., Frankforter, T. L., LaPaglia, D. M., . . . Carroll, K. M. (2016). Randomized trial of computerized cognitive behavioral therapy for alcohol use disorders: efficacy as a virtual stand-alone and treatment add-on compared with standard outpatient treatment. *Alcoholism: Clinical and Experimental Research, 40*(9), 1991-2000.

7 - Miragall, M., Baños, R. M., Cebolla, A., & Botella, C. (2015). Working alliance inventory applied to virtual and augmented reality (WAI-VAR): psychometrics and therapeutic outcomes. *Frontiers in Psychology, 6.*

8- Morie, K. P., Nich, C., Hunkele, K., Potenza, M. N., & Carroll, K. M. (2015). Alexithymia level and response to computer-based training in cognitive behavioral therapy among cocaine-dependent methadone maintained individuals. *Drug Alcohol Depend, 152*, 157-163. doi: 10.1016/j.drugalcdep.2015.04.004

9 - Ormrod, J. A., Kennedy, L., Scott, J., & Cavanagh, K. (2010). Computerised cognitive behavioural therapy in an adult mental health service: a pilot study of outcomes and alliance. *Cogn Behav Ther, 39*(3), 188-192. doi: 10.1080/16506071003675614

10 - Purves, D. G., & Dutton, J. (2013). An exploration of the therapeutic process while using computerised cognitive behaviour therapy. *Counselling and Psychotherapy Research, 13*(4), 308-316. doi: 10.1080/14733145.2012.761259

11- Richards, D., Timulak, L., & Hevey, D. (2013). A comparison of two online cognitive-behavioural interventions for symptoms of depression in a student population: The role of therapist responsiveness. *Counselling and Psychotherapy Research, 13*(3), 184-193. doi: 10.1080/14733145.2012.733715

12 - Scherer, S., Alder, J., Gaab, J., Berger, T., Ihde, K., & Urech, C. (2016). Patient satisfaction and psychological well-being after internet-based cognitive behavioral stress management (IB-CBSM) for women with preterm labor: A randomized controlled trial. *Journal of Psychosomatic Research, 80*, 37-43.

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Framework Synthesis 1: Papers that have investigated components of the therapeutic alliance

Paper	Goal	Task	Bond	Collaboration/ partnership	Confidence in treatment	Openness	Client initiative	Interactivity	Availability
1	Adapted WAI. Session 1 of program included definition of goals. α = .78 Goal in both treatment conditions (standardised and tailored) higher than neutral midpoint (3.62 and 3.96 respectively, 5-pt scale)	Adapted WAI. α = .84 Task in both treatment conditions (standardised and tailored) higher than neutral midpoint (3.23 and 3.80 respectively, 5-pt scale). Note – slightly lower than goal scores.	Not adapted to TBI – applied to therapist.						
2	Wasn't measured, but first session of the treatment includes establishing an achievable goal.		Adapted ARM. α > .7 Mean bond scores were higher than neutral midpoint at week 4 and 10 (5.99 and 6.13 respectively, 7-pt scale).	Adapted ARM. α > .7 Mean partnership scores were higher than neutral midpoint at week 4 and 10 (5.32 and 5.53 respectively, 7-pt scale).	Adapted ARM α > .7 Mean confidence scores were higher than neutral midpoint at week 4 and 10 (5.59 and 5.92 respectively, 7-pt scale).	Adapted ARM α = .56 - .66 (lower than the other subscales). Mean openness scores were higher than neutral midpoint at week 4 and 10 (5.30 and 5.63 respectively, 7-pt scale).	Adapted ARM Psychometric issues (negative inter-item correlations) with subscale led it to not being included in analyses.	None.	
3	Qual. theme "working in partnership" is relevant – in particular, the subtheme "motivated goal attainment". Participants felt they could work	Qual. theme "responsiveness" is relevant – mixed perspectives as to whether the program appropriately responded to their individual needs.	Adapted ARM. α = .82 Mean bond scores higher than neutral midpoint (5.50, 7 pt. scale). Qual. theme "empathy and acceptance" is relevant – most	Adapted ARM. α = .76 Mean partnership score slightly higher than neutral midpoint (4.71, 7pt scale). Qual. theme "working in partnership", and	Adapted ARM. α = .86 Mean confidence scores higher than neutral midpoint (5.11, 7pt scale) Qual. theme "confidence and reassurance" relevant – most	Adapted ARM. α = 74. Mean openness scores higher than neutral midpoint (5.34, 7 pt scale). Qual. theme "openness" relevant – program gave	Adapted ARM. α = .30. Mean client initiative score slightly above neutral midpoint (4.40, 7pt scale) but serious psychometric issues with subscale.	Qual. theme "interactivity" relevant – interactive elements and viewing graph of feedback/ symptoms experienced as useful for most.	Qual. theme "availability" relevant – convenience and 24/7 access viewed as major advantages.

	with myCompass to set and work towards goals.		interviewees felt accepted, understood and not judged.	subthemes "collaboration" and "motivated goal attainment" also relevant. All interviewees felt they collaborated flexibly with program to work towards goals.	participants expressed confidence in program, a respect for it, and an optimism that the skills it taught would help them manage their mental health.	privacy which was valued, felt comfortable sharing feelings openly.	Qual. theme "client intiative", and subthemes "able to set one's own agenda and goals" – offers structured recommendations, but also some choice over tasks and modules (could choose how program was used).	However feedback sometimes experienced as putting on extra pressure.	
4	Qual. data relevant – concern over how personalised/ relevant cCBT was to their needs. Didn't feel they could understand the underlying cause of their problems with cCBT.	Qual. data relevant – similar to goal column, discussion of personalisation. Participants often felt that tasks in cCBT weren't appropriate for helping them.	Therapeutic relationship subscale scores relevant (measure things like feeling understood). Ranged from 1.94-3.33 (5pt scale) – not particularly high. Alpha not reported. Qual. theme "Solitary" also relevant – cCBT tried to compensate for lack of interpersonal contact with use of relevant examples (not everyone related though). Verbal responses in program were not successful in conveying empathy.						
5	Adapted WAI. $\alpha = .75$ Means higher than neutral midpoint at Session 2, 4 and 8 respectively:	Adapted WAI $\alpha = .84$ Means higher than neutral midpoint at Session 2, 4 and 8 respectively: 5.75;	Adapted WAI $\alpha = .78$ Means higher than neutral midpoint at Session 2, 4 and 8 respectively: 5.37;						

#									
	5.52; 5.55; 5.71 (7 pt. scale)	5.64; 5.83 (7 pt. scale)	5.15; 5.09 (7 pt. scale)						
6	Adapted WAI. Alpha not reported. Mean goal score higher than neutral midpoint (5.6, on 7 pt. scale)	Adapted WAI. Alpha not reported. Mean task score higher than neutral midpoint (5.9 on 7 pt. scale)	Adapted WAI. Alpha not reported. Mean bond score higher than neutral midpoint (5.5 on 7 pt. scale)						
7	Only overall WAI mean score reported; factor analysis indicated a uni-dimensional structure. α for overall scale = 0.906 α for goal = 0.70 Mean score for overall WAI was 65.93 (range of possible scores 12-84). Subscale means not reported.	See previous column. α for task = 0.92 Subscale means not reported.	See previous column. α for bond = 0.86 Subscale means not reported.						
8	Adapted WAI – no individual subscale statistics reported. No descriptive statistics or alpha reported.	Adapted WAI – no individual subscale statistics reported. No descriptive statistics or alpha reported.	Adapted WAI – no individual subscale statistics reported. No descriptive statistics or alpha reported.						
9			Adapted ARM. α = .74 Mean bond scores were higher than the neutral midpoint (5.16 on a 7 pt. scale)	Adapted ARM. α = .59 Mean partnership scores were higher than the neutral midpoint (4.97 on a 7 pt. scale)	Adapted ARM. α = .68 Mean confidence scores were higher than the neutral midpoint (4.95 on a 7 pt. scale)	Adapted ARM. α = .68 Mean openness scores were slightly higher than the neutral midpoint (4.60 on a 7 pt. scale)	Adapted ARM. α = .26 – very poor. Mean client initiative scores were slightly higher than the neutral midpoint (4.35 on a 7 pt. scale)		

10	Program did not always allow people to work on their goals – some wanted to explore their issues on a deeper level and felt frustrated that they could not do this. Could not develop a deeper relationship with virtual therapist.	Personal relationship with program strengthened by offering different modules in response to users' individual issues; produced a unique "Roadmap". Structure of program also helped them to identify solutions to their problems. Activities such as situational analysis helped people examine their feelings and behaviour.	Cartoon representations of program authors described with warmth and enthusiasm, felt encouraged and praised by them. Importance of building up trust (concerns over confidentiality, importance of credibility)						
11	Adapted WAI Only alpha for total scale given = .84 - .86 across sessions. Goal means ranged from 3.5 – 3.7 across sessions.\n\n(doesn't say what pt. the scale is rated on)	Adapted WAI Only alpha for total scale given = .84 - .86 across sessions. Task ranged from 3.7 – 4.0 across sessions. (doesn't say what pt. the scale is rated on)	Adapted WAI Only alpha for total scale given = .84 - .86 across sessions. Bond ranged from 2.9 – 3.2 across sessions. Notably lower than goal and task. (doesn't say what pt. the scale is rated on)						
12	Adapted WAI. No alpha values reported. Mean task score across modules was around neutral midpoint (3.06 on 5pt. scale) Goal ratings significantly higher than	Adapted WAI. No alpha values reported. Mean goal score across modules was higher than neutral midpoint (3.53 on 5pt. scale) Goal ratings significantly higher than control condition (non-							

	control condition (non-therapeutic online tasks e.g. Sudoku)	therapeutic online tasks e.g. Sudoku).						
13	Adapted WAI Alpha not reported. Mean goal score was 5.61 (doesn't say what pt. the scale is rated on). Assuming 7pt. scale, this is above neutral midpoint.	Adapted WAI Alpha not reported. Mean task score was 5.92 (doesn't say what pt. the scale is rated on) Assuming 7pt. scale, this is above neutral midpoint.	Adapted WAI Alpha not reported. Mean bond score was 5.74 (doesn't say what pt. the scale is rated on) Assuming 7pt. scale, this is above neutral midpoint.					

Framework Synthesis 2: Factors examined for their influence on the human-technology relationship

Papers	TBI Characteristics					User Characteristics			Other	
	Tailoring	Flexibility	Technology features	Credibility	Privacy	Completer status	Users' mental health	Alexithymia	Change over time	Relationship with therapist
1	Goal and task scores higher in tailored than in standardised condition. Fit between participants' goals/needs was higher in tailored condition.									
2						Program completers and non-completers did not differ in alliance levels at either week 4 or 10.			Change in alliance from week 4 to 10: Increased confidence in the program, but no significant change in partnership, bond, openness, or client initiative.	
3		A participant reported losing confidence in program due to compulsory tasks. Linear structure also viewed negatively by some. Offering people ability to choose modules and monitoring	Automated alerts and reminders helped people stay motivated towards achievement and keep on track. Choice of platform.							

			dimensions was generally seen as empowering.						
4				Verbal responses in cCBT not successful in eliciting empathy.		Participants also felt less judged since they worked through the cCBT program alone, and could be more anonymous.			
5				Feeling that the program's characters were relatable and liking the narrator was linked to higher alliance. Perceptions of program as boring linked to lower alliance.			No difference between program completers and non-completers on alliance		Bond scores decreased over time, but task and goal scores were stable over time.	Bond scores mostly not related to alliance with counsellor. Other subscales were correlated. Alliance and satisfaction with counsellor were mostly unrelated, with the exception of the total score, goal and task correlated at session 4, and task at session 8. Bond not related at any time point.
6										
7										Alliance with therapist – large correlations between overall scores. All items correlated except 2, that

#											
											pertained towards goals.
8								Alliance not related to participants' level of alexithmia (difficulties identifying emotions).			
9											
10		Structured format felt to bring order to people's experiences -made it more manageable to work on problems. Control increased. Variety of modules offered enhanced sense of connection.	Using the participants' name implied familiarity and care. Importance of the way material presented – multimedia including colours, music, written info – was more engaging. Use of avatars to represent program authors – felt to be supportive etc. Enhanced bond.	Credibility influenced trust (part of bond).		Users' current state of mental health could make it hard to engage in self-help (e.g. if very low).	Concerns about confidentiality and personal info being entered into the computer – had to build up trust.				
11											
12											
13											

Framework Synthesis 3: Papers that examined treatment outcomes and engagement

Paper	Clinical outcomes	Treatment satisfaction	Engagement
1	Anxiety. No correlation for goal or task with symptoms in tailored condition. Task at all time points associated with symptoms in standardised condition; goal positively associated but not always significant. Authors note this may be due to lack of variability in WAI scores in tailored condition.		
2			
3	Examined: depression; anxiety; stress; impact of mental health on functioning; positive mental health and functioning. All non-significant, small correlations. Association of "openness" with emotional wellbeing approached significance, as did the composite (bond, partnership and confidence) score with psychological wellbeing.		Composite score (bond, partnership, confidence = emotional connection quality) related to program log-ins, modules undertaken and self-monitoring frequency. Client initiative and openness only correlated with self-monitoring frequency.
4			
5	Cocaine use outcomes (e.g. abstinence from cocaine) – alliance was not related to outcomes, when controlling for other characteristics.	Alliance and satisfaction with treatment not associated. Alliance was related to attributions of change – those with higher alliance scores were more likely to attribute change to the treatment.	Higher goal and bond scores at session 4 associated with more TBI modules completed. Alliance scores not associated with number of sessions with substance use counsellor.
6			
7	Clinically significant change (phobia and adjustment disorders) – significantly higher scores for recovered and improved patients compared to those that hadn't changed. No significant difference in alliance scores between recovered and improved patients. Including alliance in a regression model did add some explained variance in clinically significant change. Notable – is with a different therapy type than other TBIs (is VR/AR).		
8			

9	Examined anxiety and depression symptoms – no significant association with alliance scores.		
10			
11	No significant correlations between alliance measured at any time point and depression outcomes.		
12	Overall alliance associated significantly with stress and trait anxiety, not state anxiety. Task and goal associated significantly with stress, state anxiety and trait anxiety.	Alliance more strongly predicted satisfaction than symptom reduction did. Those with high satisfaction ratings had higher alliance ratings.	
13			

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